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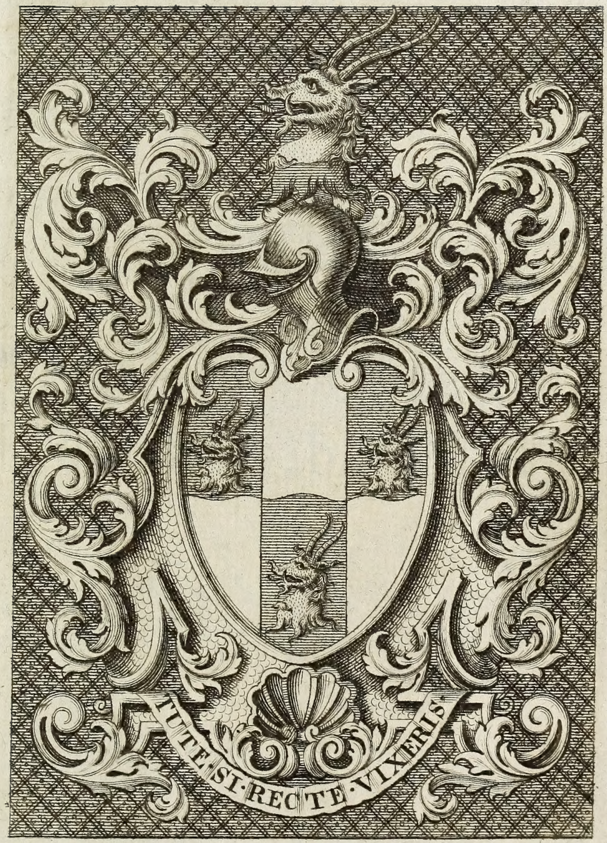
TUTE·SI·RECTE·VIXERIS

BRITISH MUSEUM NATURAL HISTORY

PHILOSOPHICAL Tranſactions:

GIVING SOME

ACCOMPT

OF THE

Preſent Undertakings, Studies and Labours

OF THE

INGENIOUS

IN MANY

Conſiderable Parts

OF THE

WORLD.

VOL.IX. Beginning the Second Century.

For the Year MDCLXXIV.

LONDON,
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at the *Bell* in St. *Pauls* Church-Yard.

BRITISH MUSEUM
NATURAL H

TO THE
RIGHT HONORABLE
Sir *Joſeph Williamſon* Knight,
PRINCIPAL
SECRETARY of STATE.

SIR,

H*Aving begun this New Century of the* Philoſophical Tranſactions *near the time, that your Merits raiſed you to that eminent place you are now poſſeſs'd of; and conſidering alſo the ſteddy inclinations, you do on all occaſions expreſs to advance the Ingenuous Arts: For theſe and other good reſpects, I hold my ſelf obliged to preſent you with the firſt Volume of theſe my new beginnings. In which Volume I adventure to mention ſuggeſtions*

ſuggeſtions pretending the Improvements of England *by Agriculture and Trade; by Diſcipline and Induſtry; by Conduct and Manufactures.*

The Rural *Arts were the ſerious buſineſs, and the matureſt, if not the Maſter-piece of learn'd* Varro; *and they founded the Roman Empire, ſupporting* hardy Valour, *and drawing the wheels of* triumphant Grandeur. *Theſe adorned the famous* Penſil Garden *of the firſt Monarchy, and they enlarg'd the Spicy Groves and ſpacious Orchards of the* Medes *and* Perſians; *as* Trade *and Navigation raiſed the greateſt Cities, Wealth and Magnificence of all former and later Ages. And the* Mathematicks *perform'd all the true wonders in the Ages of wonder, both in the Eaſt and Weſt, as far as the Sun does travel.*

Of theſe Propoſals there are ſome ſo manifeſtly and generally beneficial, ſo well tryed, or allowed, and encouraged by our expreſs Laws, that they gave me the confidence to recommend them to the Generous. In this rank, I conceive, are, The ſpreading of practical Mathematiques in all our Trade-towns and Ports; the making great Rivers navigable, to increaſe Trade; the Fiſhery and Navigation; the ſeveral ways of fertilizing barren lands, and of cultivating waſte grounds; the draining bogues and infectious Fens, to render the Air wholeſome in all the neighbourhood, beſides other commodities proceeding from thence; the recovering the ancient reputation of our main Staple-trade by the beſt kinds of Drapery and other Expedients; the increaſing our Linnen-trade; the reducing our numbers of idle perſons and vagrants to work for their own relief and the public good; the making of Latton, and other curious works in Iron, Tin, Copper, and other Mettals, which our own Mines afford; the making Salt and Salt-peter of our own at home, and enough for our own occaſions; the making of fine Paper; the raiſing of Nurſeries of Fruit-trees and Gardens of rare and exotic Vegetables, as far as our Soyl and Climat will entertain them; to ſhelter, enrich and embelliſh all fair Manſions and Towns (chiefly our famous Univerſities, for an Exemplar to the reſt,) with Groves of Fruit and Mulberry-trees, and fragrant Evergreens. Whatſoever does apparently conduce to the Health, Strength, Populouſneſs and Welfare of theſe his Majeſties Kingdoms, ſuch Propoſals I ſcruple not to recommend and endear to all that have hearty affections for their Native Country and their own Patrimony. Other Overtures which are out of my Sphere, I referr to a higher Experience; my Station and my Inclinations engaging me only to urge the fore-

mentioned and the like concerns. Upon which account, Sir, I alſo ſcruple not to ſollicite the continuance of your favour to advance the Deſigns of the Royal Society, *according to his Majeſties Intentions expreſt in the Royal Charter, in regard of the great and many opportunities, that will offer themſelves into your hands, both by forrain negotiations, and domeſtick concernments.*

By the Experience of late Years we have grounds to hope, That, while our Engliſh Nobility and Gentlemen are pleas'd to bring home uſeful Arts and ingenious Diſcoveries of Nature from their Travels; the largeneſs of our Commerce abroad, and the growth of Arts at home, and the Obſervations of judicious Antiquaries, will be a threefold advantage for the reputation and benefit of England, *and caſt an acceptable and obliging aſpect over all his Majeſties Dominions.*

The moſt difficult and curious parts of Phyſiology and Geometry, of Opticks and Aſtronomy, have grown in England, *and in the chief places of Chriſtendom, in few years faſter than ſome untractable men are willing they ſhould grow. And theſe Abſtruſities give good ſatisfaction and ſincere delight to the deeply Intelligent and truly Reaſonable. On the other hand, Rural diligence and Trade bring-in to the Multitude a ſenſible reward, with numberleſs varieties of emoluments and accommodations: In theſe alſo there hath ſomething been lately done among us. In* Scotland *alſo they begin, on one hand, to erect Aſtronomical Obſervatories, and on the other, to call for Dutch Gardiners and Nurſeries about their chief Cities and Univerſities. And* Ireland *ſhakes off her priſtin lazineſs, being now buſy in providing fine Linnen for themſelves, Sayles and Rigging for Ships, for Commerce, and for their Fiſhery; in tilling more land, and in turning their Moſſy grounds into Gardens of Potatoes. The very wilderneſs of* New England *is, on a ſuddain, become a fruitful Orchard, fenced with Ships of their own building, and border'd with Stages and all furniture for their Fiſhery. And in leſs time, by Gods bleſſing,* Jamaica *may be the faireſt Garden of the world.*

And now, Sir, *'tis unneceſſary, I ſhould ſay more to you, either for the one or the other, for the more Sublime, or for the more Uſeful Arts. Your own Genius, without any other impreſſment, will make Inferences leading to further advantages. Mean while, I am full of hopes, I ſhall not miſs of my honeſt aime, by what hath already appear'd from you in the fair Buildings of* Queens

Colledge *in* Oxford, *with other conſiderable Monuments; which will be permanent Records of your Generoſity towards the encouragement of Learning, Arts and Sciences: So that I ſhall not need to run out into more prolixity, than only to ſubſcribe my ſelf what really I am,*

SIR,

Your very humble

and faithful

Servant,

Henry Oldenburg, *S.R.S.*

A Liſt of ſome Philoſophical and other Curious Books, deſired by the Printer of theſe Tracts (by whom they are vendible) to be mentioned here.

JOh. *Chriſtopheri Sturmii* Collegium Experimentale, ſive Curioſum, in quo Primaria hujus ſeculi Inventa & Experimenta Phyſico-Mathematica, explicantur, *in quarto.*

Conringii diſſertatio de Studiis Liberalibus Urbis *Romæ* & *Conſtantinopolis.*

Wedelii Experimentum Chymicum Novum, *duodecimo.*

Joannis Baptiſtæ Sitoni Miſcellanea Medico Curioſa *quarto.*

G. *Hieronymi Velſchii* Hecatoſteæ II. Obſervationum Phyſico-Medicarum, ad Illuſtrem Societatem Naturæ Curioſorum in *Germaniâ*, cum Figuris. *quarto.*

Lucæ Schrockii pharmacopœiæ Auguſtanæ reſtitutæ ſuſcepta Defenſio, ficto nomine vocati *Philonis Naſturtii* poſtſcriptum, & hanc reſpiciens *Schmuziana* Antitheſis excutitur. *quarto.*

Chriſtiani Menzelii lapis Bononienſis in obſcuro lucens collatus cum Phoſphoro Hermetico. Bilefeld. *duodecimo.*

Hermanni Conringii de Nummis *Ebræorum* Paradoxa. Acceſſerunt ejuſdem de Republicâ *Ebræorum* exercitatio Academica, ac de Initio Anni Sabbatici, & tempore Meſſis *Ebræorum* commentariolus. 4°.

Georg. Wolfg. Wedelii Experimentum Chymicum novum de Sale volatili Plantarum. 12°.

Johannis Bohnens Epiſtola ad *Joelem Langelottum*, de Alcali & Acidi inſufficientia pro Principiorum ſeu Elementorum corporum naturalium munere gerendo. 12°.

Jacobi Barneri de Spiritu Vini ſine Acido. *octavo.*

Ejuſdem, Duumviratus Acidi & Alcali exauctoratus, hoc eſt, Demonſtratio fundamentalis Acidum & Alcali non eſſe corporum naturalium principia, Acidum non eſſe principium Archeale, nec ſufficere duo hæcce ad unionem miſtionis. *octavo.*

Friderici Zobelii Tartarologia Spagyrica, ſeu medicamentorum ex Tartaro, in laborato-

rio

other *Century* in this preſent *March:* My *firſt* Volume containing the *two firſt* years, as partly interrupted by our *public* Calamities, and part of the time laid out for *Inſtructions* and *Exemplars* to prepare and incline our generous Correſpondents, to adhere cloſely to the Truth of Nature by faithful Experiments, and to evidence of matter of fact in their Hiſtorical Narrations.

And I ſhall not here take much notice of the Obſtructions and Diſcouragements, that *have been* and *are* caſt in our way by the Malevolent, they being ſufficiently puniſh't by this, that they exclude themſelves from the knowledge of *Gods admirable Works* and of *ingenious Inventions.*

Mean while, the *Virtuoſi* may encourage themſelves and receive ſatisfaction from that noble *Elogy*, which was long ago provided for them by the elegant Poet *Claudian* ;

Ipſa quidem VIRTUS precium ſibi, Soláq; laté
Fortunæ ſecura nitet, nec faſcibus ullis
Erigitur, plauſúve petit clareſcere vulgi ;
Nil opis externæ cupiens, nil indiga laudis,
Divitiis animoſa ſuis, immotâque cunctis
Caſibus , *ex alta mortalia deſpicit arce* :
Attamen invitam blandè veſtigat, & ultrò
Ambit honor ——

De Conſulatu Mallii Theodori Panegyris.

The very ſame, in effect, which a more antient and a more genial Poët, *(Horace,)* tuned to his Lyre, in the age, and in the ear, and with the high applauſe of great *Auguſtus Cæſar* ;

Virtus, repulſæ neſcia ſordidæ,
Intaminatis fulget honoribus,
  Nec ſumit, aut ponit ſecures,
    Arbitrio popularis auræ.
Virtus, recludens immeritis mori
Cælum, negatâ tentat iter viâ,
  Cætúſque vulgares, & udam
    Spernit humum, fugiente pennâ.

Carm. l. 3. Ode 2.

And an other, *(Ovid)* in few words, lays down the grounds and withall the final unſucceſsfulneſs, of all our adverſaries calumnies and rallieries ;

Paſcitur in vivis *Livor, poſt fata quieſcit* ;
  Tunc *ſuus ex merito quemque tuetur Honos.*

L. 1. Amor.

And the Prince of Latin Poëts, *Virgil*, ſaw amongſt his *Heroes* in his flowry *Elyſium*, the Valiant for their Countrey, the Eloquent, and the Inventors of Arts for humane Accommodations, and thoſe who purchaſed laſting Honor by real merit: Theſe, he ſaw there crown'd with Garlands as white as ſnow:

Heic manus, ob patriam pugnando vulnera paſſi;
Quique pii Vates, & Phœbo digna locuti;
Inventas aut qui vitam excoluêre per Artes, Æneid. 6. v. 660.
Quique ſui memores alios fecêre merendo:
Omnibus his niveâ cinguntur tempora vittâ.

Theſe old Elogies do juſtly belong to our Noble Friends and worthy Correſpondents, who do ſpend ſo much of their Lives, and Labors, (and ſome their Treaſures alſo,) to oblige even the ungrateful, and their yet unborn Poſterity.

Now I go on chearfully and with a reſolved mind, beginning with

A Letter, not long ſince written to the Publiſher by an Experienced perſon reſiding at Amſterdam, *containing a true Deſcription of* Nova Zembla, *together with an intimation of the advantage of its ſhape and poſition.*

SIR,

I Herewith ſend you what I have received out of *Muſcovy*, which is a New Mapp of *Nova Zembla* and *Weigats*, as it hath been diſcover'd by the expreſs order of the *Czar*; and drawn by a Painter, called *Panelapoetski*, who ſent it me from *Moſco* for a preſent: By which it appears, That *Nova Zembla* is not an Iſland, as hitherto it hath been believed to be; and that the *Mare glaciale* is not a Sea, but a *Sinus* or Bay, the waters whereof are ſweet. Which is the ſame with what the *Tartars* do alſo aſſure us, who have taſted thoſe waters in the very midſt of the *Sinus*. The *Samojeds* as well as the *Tartars* do unanimouſly affirm, that paſſing on the back of *Nova Zembla*, at a conſiderable diſtance from the ſhore, Navigators may well paſs as far as *Japan*. And 'tis a great fault in the *Engliſh* and *Dutch*, that ſeeking to get to *Japan* on the South-ſide of *Nova Zembla*, they have almoſt always paſſed the *Weigats*. The letter O in the great

River *Oby* marks the place of a Cataract or Fall of waters. The letter *K* denotes the conjunction of *Zembla* with the Continent. The River marked *L*, runs toward *China*, called *Kitaie*: which is not every where navigable, by reaſon of the rocks and other inconveniences that obſtruct the paſſing of veſſels. *Weigats* it ſelf is very difficult to paſs, becauſe of the great quantity of Ice, continually falling into it out of the river *Oby*, whereby that ſtreight paſſage is ſtopp'd up. The *Samajeds* go every year a fiſhing upon the ſaid ſweet Sea and that on *Nova Zembla*'s ſide *. * *See the Fig. annexed.*

A way of extracting a Volatil *Salt and Spirit out of Vegetables; intimated in* Numb. 100. p. 7002; *Experimented, and imparted by the Learned and Intelligent Dr.* Daniel Coxe, *Fellow of the* R. Society.

TAke, in warm weather, a conſiderable quantity of the Leaves of any Vegetable, ſtripp'd or pulled from the greater ſtalks; lay it on a heap, preſſing it pretty cloſe together: They will ſoon become very hot, eſpecially in the middle, and after a few days reſolve into a pappy ſubſtance (excepting the outward leaves,) which being made into pellets, and put into a Glaſs-retort, and diſtilled, will yield, beſides a great quantity of liquor, much thick black Oyl of a balſamick conſiſtence. The liquor being ſeparated from the Oyl, and diſtilled in a tall Glaſs-body, a *Volatil* Spirit ſublimes, which, after one, two or three rectifications, becomes perfectly *Urinous*, not to be diſtinguiſh't, by ſmell or taſte, from well-rectified Spirit of Harts-horn, Blood, Urine, or Sal Armoniac.

I never made tryal of any Herb, which, thus ordered, did not yield the mentioned ſubſtances; although I have examin'd many by this method of procedure, which ſeem'd very different from each other as well in ſenſible qualities, as thoſe vulgarly called occult; ſuch as Rue, Sage, both Celondines, Carduus benedictus, Tobacco, ſtinking Orach, garden Scurvygraſs, the leſſer Spurge, Baum, Mint, Tanſy, Camomil, Monks Rhubarb, ſeveral Docks, and even common Graſs, with many others, which it were altogether unneceſſary to enumerate; beſides Flowers of Elder, Pæony, Cowſlips, Clove Gilliflowers, &c. with ſeveral ſorts of Moſſes, and Rudiments of Vegetation; which laſt is a green ſubſtance on the ſurface of the earth, in rivers, ciſterns, where rain often falls, and on ſhips between wind and water, very apt to run into moſs and fibres.

Note, 1. The Veſſels, wherein theſe Diſtillations were performed, though exceedingly well waſhed with water, ſcowred with common ſalt, ſand, aſhes, ſoap, fixt ſalts, &c. and afterwards expoſed many years unto the Air, wind, rain, dews and froſts, yet nevertheleſs retain'd a very ſtrong ſmell, not much unlike that of *Muſc*.

2. The water left at the bottom of the glaſs, after the firſt rectification, was ſomewhat acetous; eſpecially when the herbs were not ſufficiently fermented.

3. If the Herbs are duly fermented, they leave little ***Caput mortuum***, ſometimes not a twentieth, and never, by my trials, above a tenth part; whereas diſtilled ***before*** fermentation they leave much more: And this remaining coal, burnt to aſhes, yields ſcarce any Alcali or fixt Salt.

4. The Volatil Salt is much more than the Fixt Salt would have been, afforded by the herb incinerated the ordinary way.

5. All thoſe Herbs which yield ſtore of fix'd Salt (ſuch as Wormwood, Carduus, Mugwort, Sage, &c.) do likewiſe, being thus managed, afford plentifully a Volatil Salt.

6. Theſe Volatil Salts being highly rectified, did not, that I could perceive, differ from each other; as neither do Vinous Spirits of fermented Vegetables, or their Fixed Salts highly purified and rectified.

7. During the Fermentation, the room would be ſtrongly perfumed ***at the beginning*** with the natural ſcent of the Herb, if it had any eminently peculiar ſmell; ***in the middle***, with the ſcent of a mixt between that and the Urinous: But being well putrified, became ſenſible Urinous.

8. The diſtilled liquor of ſome herbs, at the firſt rectification, yielded a Spirit very hot; but the laſt inclined rather to that of pungent vinous ſpirits of Scurvygraſs, Horſe-radiſh, being, if I may ſo ſpeak, piperaceous and biting, rather than like Volatil Salts; but after repeated rectifications, one, two, or more, according to the nature of the plant, or time it had fermented, became perfectly Urinous. This was uſually, when

the Herbs had not duly fermented ; which proceeded, in my apprehenſion, from ſome commixture of Eſſential oyl, which by reiterated rectifications is either ſeparated or tranſmuted. The ſame happens in the Vinous ſpirits of fermented Vegetables, and in their fixed Salts.

9. In the Diſtillation of the putrified herbs, the Urinous Spirits and ſalt came chiefly at the latter end with the Oyl, in the form of a thick white cloud or fumes, and condenſing in the Recipient, formed an innumerable company of very irregular crooked rivolets, exactly after the manner of Harts-horn, Blood, &c ; and at the beginning came the Phlegme with moſt of the *Acetum* in great drops with little fume, and the rivolets ſtrait, and without *ſtriæ* and wandrings.

10. Some herbs, as Winter-ſavory, Sage, &c. in the firſt diſtillation yielded copiouſly a Volatil Salt in a dry form, which did coat the Receiver, and ſublimed into the neck of the Retort: So doth Tobacco ; and *once* Saffron did ſo, in digeſtion with ſpirit of wine.

11. All plants, thus fermented, yielded plentifully (eſpecially toward the latter end of the diſtillation,) a fætid groſs oyl, which, if the herb was well putrified, did not in the leaſt reſemble the plant which produced it ; and I could hardly perceive, that they differ'd from each other in either taſt or ſmell : only, if the plant was not throughly fermented, an Oyl would come over at the beginning of the diſtillation, which, as alſo the water, would retain exactly the taſt and ſmell of the vegetable, which afforded it ; and it would be fluid and tranſparent, like other Eſſential oyls. The Oyl of herbs very well putrified came over chiefly *at laſt*, and did require a very ſtrong fire to extricate it out of the herb; was moſtly, eſpecially that which comes laſt of all, of the colour and conſiſtence of Tar, very tenacious, and did far and wide emit a very odd, faint, fetid, offenſive odour : If any thing became infected by this oyl, it was not to be freed from it in a long time.

12. Herbs, which, diſtilled in an Alembic with water, yield little Eſſential oyl, as Baume, Mint, Camomil, &c, afford much of it, thus fermented : And thoſe, that give much Eſſential oyl, as Wormwood with many others, being putrified, yield abundantly more.

13. During putrefaction, the herbs became exceedingly hot, eſpecially thoſe that were cloſely compreſſed and had ſtore of moiſture in them; ſo that I could as well detain my hand in the flame of an ordinary fire, as in the midſt of them.

14. Fatty, moiſt, and inſipid herbs, ferment much ſooner, and with greater heat, as Graſs, Docks, Garden Scurvy-graſs, Celondine, &c: Drier and much more ſapid plants, more leiſurely, and with leſs heat, as Winter-ſavory, Roſemary, Sage, Rue, Mint. The Stalks of no herbs ferment ſo ſoon, as the Leaves freed from them. This is moſt evident in Docks, whoſe tender parts are pappy and mucilaginous, when the ſtalks are entire.

15. Herbs ſeem by this putrefaction to be deprived of all their ſpecifical or peculiar properties: Celondin looſes its tinging quality; Spurge, its milk, veſicating and poiſonous nature, &c.

16. Herbs, which *before* putrefaction were extreamly fetid, as *Atriplex olida*, &c. became afterwards either inodorous, or not ill ſcented: And, on the contrary, Monks-Rhubarb, Garden-Scurvy-graſs, with many other inodorous vegetables, *during* putrefaction became abominably and almoſt inſupportably fetid, like the worſt of Excrements; all which yet they loſt immediately upon diſtillation.

17. None of thoſe Flowers, I have hitherto uſed, do ſtink in fermentation.

18. Many of the herbs, thus putrified or fermented, ſwarm with *Maggots*, (an argument of the cloſe and ſtedfaſt contexture of the Seminal principles in Plants,) eſpecially at the bottom, and in the middle, whither Flies and other Inſects can have no acceſs to depoſit their eggs, and where the heat is ſo violent, that they could not poſſibly ſubſiſt.

19. Yet the Volatil ſpirit and ſalt is not afforded by theſe Inſects: For, having diſtilled ſeparatly a great quantity of them, they yielded no volatil ſalt or ſpirit, but a liquor of a very different nature.

20. Herbs fermented in a great Glaſs with a narrow neck, the mouth left open, in a few weeks became, for the greater part, a mucilage, and diſtilled a year after they had ſtood ſo open, yielded a little Urinous ſpirit, but not a drop of Oyl.

21. Vegetables, if the external Air be excluded from them, will not putrify or ferment.

22. Some herbs, Moſſes, and Rudiments of Vegetation, yield a Volatil Salt, diſtilled without previous fermentation; as do alſo many *Seeds*, and ſeveral of them ſufficiently inſipid.

23. Theſe Volatil ſpirits and Salts have not only the ſame ſenſible properties; but alſo agree in all known effects and operations with common Urinous ſpirits and ſalts; as, in the changing Syrup of Violets and many other vegetable tinctures green; in being Diaphoretic, Diuretic, and De-obſtruent: Contrary to *Acids*, which they do mortifie; præcipitate all mettals and minerals diſſolved in acid menſtruums; being highly rectified, and mixt with perfectly dephlegmed ſpirit of wine, ſtrike the *offa alba*, as Chymiſts ſpeak: They unite with Acids, and thereby become Armoniac, or Neutral Salts; and indeed perform whatſoever can be expected or deſired from the common Urinous Spirits or Salts.

So far our generous Naturaliſt his Communications for this time; which as they are but a ſmall part of the Analyſis of Plants, and but *one* of the heads of the *Hiſtory about Vegetables*, the care of which, divers years ago, the *R Society* recommended to him; ſo we doubt not but he will in compliance with their deſires, and the opinion they juſtly entertain of his known abilities, ſeduloſly proſecute this excellent work, and farther, from time to time, impart to the Philoſophical world that great ſtock, he hath already in ſtore concerning this and many other ſubjects of Phyſiology. Mean time, we are obliged to do him that right, as to acquaint the Publick, that this way and theſe Experiments were made by him about *eight* years ago, and then moſt of them by converſation communicated to the Honourable *Robert Boyle*, who doubtleſs will be ready, upon occaſion to atteſt it, as well as divers other Members of the *R. Society*, as will alſo the *Archiva* of that Illuſtrious Body.

An Obſer-

An Obſervation of Dr. Johnſtons *of* Pomphret, *communicated by him to Mr.* Liſter, *and by him ſent in a Letter to the Publiſher, concerning ſome Stones of a perfect Gold-colour, found in Animals.*

THat no page of this Letter may be empty (ſaith Mr. *Liſter*) I ſhall tranſcribe for you an Obſervation of Dr. *Johnſtons*. In the *German* Philoſophic *Ephemerides* of the year 1672, I meet with theſe words of Doctor *Wedelius*, Obſ. 246. pag 439. *Poſſideo particulam Calculi vaccini, inſtar Auri foliorum fulgidi*; the ſubject of that Obſervation being an Enumeration and the Deſcription of ſeveral Stones found in divers Animals, as in Doggs, Hoggs, Staggs, and in Cows alſo; of which laſt the now quoted words are all he ſaith. I do begg Dr. *Johnſtons* pardon for having kept by me two years an Obſervation of this nature, which he was pleaſed to communicate to me, and which yet was ſo ſurpriſing, that I had not the aſſurance to offer it to you, being in this as well as in all other matters, relating to the *phænomena* of Natural Hiſtory, very diffident. What reaſons I then had to doubt of the truth of this Obſervation, he beſt knows, and I ſhall not trouble you with; being a little more confident ſince I read the words of D. *Wedelius*, that the Stones ſent me by the Learned Doctor were ſuch indeed, and not ſome Inſects Eggs, as I once did verily perſwade my ſelf they were.

His Letter bears date *April* 22. 1672. from *Pomphret*.

ABout this time twelve month (*ſaith the Doctor*) one *Thomas Capidge*, a butcher of *Pomphret*, killed an Ox for the ſhambles, in which nothing was obſerved preternatural, till the Bladder being blown by his ſervant, there was ſome thing obſerved ſticking to the inſide with a duskiſh froth. Keeping the Bladder half-blown, the butchers Son, who firſt diſcover'd it, knocked with his hand on the ſide and the bottom of the bladder, to make it ſettle to the neck, and by ſhaking and ſqueezing it got out the froth, and about *two hundred* little globular ſtones of ſeveral ſizes, the biggeſt being about this (O) circumference; others like pin-heads or muſtard-ſeed. He rubb'd the ſlimy froth from them, and they appear'd of a duskiſh yellow colour and ſmooth. Some he broak, and the reſt he kept in a paper; which when dry, they were like *Seed-pearl*, but more ſmooth, and of a *perfect gold-colour*, and ſo ever after continued, as you ſee them. Viewed in a Microſcope, they appeared very poliſhed, and without any rugoſities: The Figure in moſt was ſphærical; in ſome a little compreſſed; the colour like *burniſht gold.* I broke one or two of them with ſome difficulty, and I found by the Microſcope, that it was only a thin ſhell that was ſo orient and bright, the inner ſide of which ſhell was like unpoliſh't gold: The inmoſt ſubſtance was like brown Sugar-candy to the naked eye, but not ſo tranſparent: The taſte was not diſcernable. In Spirit of Vitriol they ſhrunk much and waſted, but continued their colour, (poſſibly by reaſon of the outward skin, which, it ſeems, in theſe was as difficult to diſſolve as in true pearls:) Likewiſe *Aqua fortis* would corrode and diſſolve them tumultuouſly.

Thus far the Doctor. I do not queſtion (ſo concludes Mr. *Liſter,)* but he hath ſtore of theſe *guilt* ſtones in his cabinet; for, as I remember, he was ſo choice of them, that the parcel he ſent me to view, was order'd to be returned again; at leaſt, none of them remained with me.

I am

Yours.

York March 12.
1 6$\frac{73}{74}$.

Extracts

Extracts of two Letters, written to the Publiſher from Hamborough *by the Learned* Chriſtophorus Sandius, *concerning the Origin of* Pearls.

The *firſt* is of *Decemb.* 15.1673. thus Engliſh't;

TOuching the Origin of Pearls, of which I formerly gave an intimation, be pleaſed to receive this account. The Pearl-ſhells in Norway and elſewhere do breed in Sweet waters. Their ſhells are like to thoſe, which commonly are called Muſcles, but they are larger. The fiſh in them looks like an Oiſter, and it produceth a great cluſter of Eggs, like thoſe of crafiſhes, ſome white, ſome black (which latter yet will become white, the outer black coat being taken off;) Theſe Eggs, when ripe, are caſt out, and being caſt out they grow, and become like thoſe that caſt them. But ſometimes it happens, that one or two of thoſe Eggs ſtick faſt to the ſides of the matrix, and are not voided with the reſt. Theſe are fed by the Oiſter againſt her will, and they do grow, according to the length of time, into pearls of different bigneſſes, and imprint a mark both in the fiſh and the ſhell, by the ſcituation conform to its figure.

So far the firſt Letter; the matter of which being new, but deſtitute of proof, the Publiſher took the liberty of deſiring from the Author the favour of imparting to him what ground he had for this aſſertion: Whereupon was returned this ſecond Letter, dated *Febr.* 27.1674; *viz.*

AS to the authority, I have to aſſert ſuch an origin of Pearls, as I have done in my former; I here declare, that a certain *Dane*, called *Henricus Arnoldi*, an ingenuous and veracious perſon, having by his own Experience found it ſo at *Chriſtiania* in *Norway*, did in that manner relate it to me, as I imparted it to you, he having with great ſerioufneſs aſſured me of the truth thereof. Beſides, the thing ſeems highly probable, neither do any conſiderable objections appear againſt it. If I ſhould chance to go into thoſe parts, or at leaſt into the Country of the Dukes of *Brunſwick*, where alſo Pearls are found,

not

not inferior to the Oriental ones of the ſame ſize, I ſhould not fail to endeavor to make the obſervation my ſelf.

An Accompt of ſome Books.

I. *An Attempt to prove the MOTION of the EARTH from Obſervations, made by* Robert Hook *Fellow of the R. Society.* London *in 4°. printed for* J. Martyn *at the Bell in St.* Pauls *Church-yard,* 1674.

THe Ingenious Author of this Attempt, having conſider'd with himſelf, that the grand Controverſie about the *Motion of the Earth* remains yet undetermin'd, and finding, there was no other means left for human Induſtry to decide it but by obſerving, whether there be any ſenſible *Parallax* of the Earths Orb amongſt the Fixt Stars; did thereupon reſolve to employ himſelf in making ſome Obſervations concerning ſo important a point in Aſtronomy. And, after he had examined the ways and inſtruments for all manner of Aſtronomical Obſervations, hitherto made uſe of, and conſider'd of the inconveniences and imperfections of them; and having alſo duely weighed the great accurateneſs and certainty, that this Obſervation of the *Earths Parallax* required: He next contrived a way of making Obſervations, that might be free from all the former inconveniences and exceptions, and, as near as might be, fortified againſt any other that might be invented or raiſed againſt it. This way he gives an Account of in this preſent *Tract*, which is; To obſerve by the paſſing of ſome conſiderable Star near the *Zenith* of ſome place, whether ſuch a Star doth not at one time of the year paſs nearer to that *Zenith*, and another, farther from it; thus reaſoning with himſelf, That, if the Earth doth move in an Orb about the Sun, and that this Orb hath any ſenſible *Parallax* amongſt the Fixt Stars, this muſt neceſſarily happen, eſpecially to thoſe Fixt Stars, which are neareſt the Pole of the Ecliptique.

Accordingly he affirms to have actually made four Obſervations, in this Tract deſcribed; by which, he ſaith, 'tis manifeſt, that there is a ſenſible *Parallax* of the Earths Orb to the Fixt Star in the *Dragons head,* and conſequently a Confirmation of the *Copernican* Syſtem againſt the *Ptolemaic* and *Tychonic.* Yet, like a rigid Philoſopher, not being fully ſatisfied with theſe Obſervations, he declares his extraordinary deſire to have made others with more accurateneſs, than, by reaſon of inconvenient weather and want of health, he was able to make thoſe. However, he thinks he hath given ſufficient occaſion and direction to others to proſecute this noble undertaking. At the end of the explication whereof he mentions ſome things, which he looks upon as very remarkable, occurring in thoſe Obſervations; one of which was, that in the day time, the Sun ſhining very clear, he obſerved the bright Star in the *Dragons head* to paſs by the *Zenith* as diſtinctly and clearly as if the Sun had been ſet: which he eſteems to have been the firſt time that the Fixt Stars were ſeen when the Sun ſhined very bright without any obſcuring of its light by Eclipſe or otherwiſe; that Tradition, of ſeeing the Stars in the day with the naked Eye out of a deep Well or Mine, being by him Judged a meer fiction, the thing being thought by him impoſſible.

Laſt of all, he promiſes, that he will explain to the Curious a Syſtem of the World differing in many particulars from any yet known, but anſwering in all things to the common rules of Mechanical Motions; which Syſtem he here declares to depend on *three* Suppoſitions: 1. That all Celeſtial bodies whatſoever have an Attraction or Gravitating power towards their own Centers, whereby they attract not only their own parts, and keep them from flying from them (as we may obſerve the *Earth* to do;) but alſo all other Celeſtial bodies that are within the Sphere of their activity. 2. That all Bodies whatſoever, that are put into a direct and ſimple motion, will ſo continue to move forward in a *Streight* line, till they are by ſome other more effectual power deflected and bent into a motion that deſcribes ſome *Curve* line. 3. That theſe Attractive powers are ſo much the more powerful in operating, by how much the nearer the body, wrought upon, is to their own Centers.

II. ME-

II. *MEDICINA MILITARIS*, *or a Body of* Military Medicines *experimented, by* Raymundus Mindererus, *late chief Phyſitian of the Electoral Court of* Bavaria, *&c. Engliſh't out of High-dutch.* London, *in* 8°. 1674.

THis Tract, though it be ſmall in bulk, ſeems to deliver matters of no ſmall uſe, both in War (which it was chiefly calculated for,) and in Peace; foraſmuch as it comprehends Medicines, and Medical and Chirurgical Practices, for all ſorts of common diſeaſes, and other defects and infirmities of the Body; and is eſpecially recommendable upon the account of the eaſie and cheap preparation of the remedies and helps requiſite to cure and relieve diſeaſed and wounded bodies; though they are not eaſily to be uſed without the direction of ſome good Phyſitian or Chirurgion.

The Author was a perſon of great note in his time, and ſeems to have been a man of much Experience as well as Charity; delivering the particulars, contained in this Book, chiefly upon his own tryal and ſucceſs, though partly alſo upon that of his skilful Collegues and other honeſt perſons.

III. *EPHEMERIDUM MEDICO-PHYSICARUM Germaniæ ANNUS TERTIUS*, &c. Lipſiæ *&* Francofurti, 1673. *in* 4°.

THeſe *Miſcellanies* conſiſting of ſo great a number of Obſervations as amount to 350; the narrow bounds of this *Tract* will permit us to take notice but of a few of ſo many; *viz.*

That a Stone hath been ſucceſsfully cut from under the Tongue *: *That* the powder of the *Muſcus terreſtris clavatus* is a good Antepileptick: *That*, in an Epidemical Dyſentery of more than *four hundred* perſons afflicted with that diſtemper, not one woman with child, and ſick of the ſame diſeaſe, dyed: *That* a girl, after ſhe was recover'd of the ſmall pox, did ſweat blood out of the toes of both her feet: *That* a man, being opened after his death, was found to have not above ten pound of fleſh about him, all the reſt being fat, and very ſlender bones, and the Muſcles rather membrans than fleſh: *Of* one, that had ſo copious and ſtrong a tranſpiration, that his hand, being a pretty while incloſed in a glaſs, appeared moiſt all over, and the ſides of the glaſs bedewed with ſmall drops; he alſo never voiding any thing by ſiege above once a week: *Of* an Heart altogether waſted, and dried up like an empty purſe, ſhrunk together: *That* one of the beſt remedies againſt the Pleuriſie is *Antimonium Diaphoreticum*, prepared as 'tis here preſcribed in *Obſ.* 74: *That* Balſom of *Peru* is of great efficacy in Dyſenteries: *Of* a woman, in whom, after ſhe had been brought to bed, and cured of grievous Epileptique fits, were left by a *criſis* ſeveral glanduls in her left arm, which as often as they diſappeared and vaniſhed, ſhe felt very great head-ache and other troubleſome diſtempers, but when they re-appeared, ſhe found her ſelf well again: *Of* many, cured of a Tertian ague by an infuſion of *ſtercus ſuillum* in Rhiniſh wine: *Of* a female-child without any brains, (as appeared afterwards, when it was dead,

* *Compare* Numb. 83. *of theſe Tracts.*

dead, and open'd) the mother having, about the middle time of her child-bearing, ſeen men fight, and one of them wounded in his head, the blood trickling down on every ſide, at which ſhe ſcratched *her* head : *Of* one, that having ſneeſed, at three ſeveral nights, above 300 times each night without intermiſſion, was freed for a while from that ſneeſing by a Palſie of her left ſide; yet as ſoon as her head was heated by Motion or the Sun, or affected by a cold air and wind, fell a ſneeſing again; which was cured by applying ſome leaven and amber to the crown of her head; on which there was at length found a ſoft tumor, got by a grievous fall and knock, the matter of which being heated, did by dilatation, or, being cooled, did by conſtriction, and both wayes by its acrimony, vellicate the parts, to cauſe the ſymptom : *Of* divers diſeaſes removed by a change into other diſtempers; as Convulſions into a Fever, a Fever into the yellow Jaundice, Frenſie into a Dyſentery, Head-ache into an Hæmorrhagy of the noſe; Deafiſhneſs, Spitting of blood and Soreneſs of eyes into a Looſeneſs, &c: *Of* a child, that had by miſchance ſwallow'd a piece of lead, ſuch as is commonly faſtned for a mark to cloath, which child was ſaved by giving it ſome vinegar, which open'd the body of the Lead : *Of* one that cured himſelf of the *Hungarian* diſtemper by drinking large draughts of Rhiniſh wine, and thereby provoking copious ſweats : *Of* ſeveral perſons of ſuch a temper, that they were purged, ſome of them, by the meer ſmell of a purgative, one, by the bare hearing, another by only dreaming, of the medicine * : *That* in *Livonia* the people are very ſeldom afflicted by the Stone; which is aſcribed to their way of brewing their beer all over the Country with red-hot flints : *That* Fontanels or Iſſues are very powerful to remove Head-aches, ſtubborn Defluxions, Podagrical humors, Sciatica's; as alſo to prevent Apoplexies, Epilepſies, Palſies, &c : *That* 'tis a vulgar error, that Hares do change their Sex : *Of* an odd effect of Lightning, which ſtriking into the Turret of a Caſtle, did no miſchief, but only made a ſmall hole in a ſilver coin, kept in the purſe of the watchmans wife:

* *Obſ.* 174. 234.

wiſe: *Of* a grievous Megrim, removed by Veſicatories, and Spirit of Sal Armoniac drawn in by the noſe; which proved ſo effectual, that the Patient ſoon after voided at the noſe a whole quart of water, and ſo was cured: *Of* a man, that ſpent a whole fortnight without any ſleep, and yet found no inconvenience in his vital and animal functions by it: *Of* one, that for ſeveral weeks had had an ague only in his right Arm, which came regularly about ſeven a clock in the morning, the reſt of his body remaining all the while in its natural temper: *Of* one, that upon plunging himſelf ſeveral times, when he had fits of a Tertian upon him, into a river near him, was cured; (*but beware of imitation*:) Pleuriſies, and Hydropical ſwellings, cured by the uſe of Lin-ſeed oyl: Hæmorrhoids cured by the ſmell of Myrrhe, Frankincenſe and Maſtick: *Of* one in ***Denmark***, whoſe ſpitle is as ſweet as ſugar, though he love things acid: *Of* Salts concreted into a Glaſſy ***flexil*** plate *, by mixing Spirit of wine camphorated with ſpirit of Harts-horn, and powring it upon ignited parts of Iron; from which mixture the Camphire firſt, being got out of the pores of the Spirit of wine, made the whole body of the liquor troubled and look like a ſnowy ***lanugo*** or cloud; and then it ſubſided, leaving the liquor all clear; but, ſome days after, the ſaid mixture being gently ſtirred, a very thin plate, like Muſcovia Talk, perfectly diaphanous, like glaſs, was obſerved to ſwim therein; and to ſhew, that this proceeded not from the refraction of the rays from the ſurface of the liquor, the Obſerver did ſeveral ways change his poſition, and that of the ſuppoſed glaſs, towards the light; whereupon not only the appearance of the ſaid plate did not diſappear, but by a manifeſt undulation and flexibleneſs of its own in the midſt of the liquor, it anſwer'd to every undulation of the liquor, cauſed by the gentle agitation of this glaſs.

But to proceed to ſome other Obſervations, we ſhall further take notice; *Of* one, that once in all his life time, for the ſpace of a whole Moon (which was that of *March*,) could ſee nothing at all by Candle-light, but ſaw very well as ſoon

* *See* Numb. 39. p. 780. *of theſe Tracts.*

as the Sun was riſen : *Of* a Lixivium of Quick-lime ſulphurated, that changed Spirit of Niter into a ſolid lapideous ſalt, whereas, when the Lime was not ſulphurated, it changed it only into a ſaline gumm : *Of* a young man, who, without an apparent cauſe, was after his ſleep found both ſpeechleſs, and deſtitute of all feeling, in what part of his body ſoever he were pricked with pins, though all his other ſenſes were un-violate, and he did eat, drink, walk, and ſleep very well; which diſtemper, both of his ſpeechleſneſs, and want of feeling, was perfectly cured by bleeding him in the *ranala's* of his tongue: *Of* two Puppys, cut out of their dams belly, that not only lived a quarter of an hour after their hearts had been cut out *, but alſo made a kind of creping noiſe: *Of* three child-bearing women, whereof *one*, longing for Strawberries, and having got them, was the next day deliver'd of a child, whoſe back ſeemed to be ſprinkled with whole and freſh ſtrawberries; the *other*, who longing for green herbs, after ſhe had eat ſome, was the next day brought to bed of a child, the crown of whoſe head lookt as cover'd with ſmall pieces of green herbs cut; the *third*, who at the inſtant of her travel longing for wheaten flower, and being ſatiated therewith, brought forth a child, half an hour after, that held in his knit fiſt ſomething like dry flower: *Of* leggs broken, perfectly healed with a kind of Moſs, called by Botaniſts *Muſcus pulmonarius terreſtris ſanguineus*, made into an unguent with the roots of *Conſolida major*, finely pulveriſed together, and boiled with hoggs-greaſe in a glaſed and well-cloſed pipkin : *Of* a boy, that quite loſt his tongue by ſpitting it out, when he had the ſmall pox, but was yet able, without the help of any art, not only to taſte, ſwallow, and ſpit, but to ſpeak ſo as to be well underſtood; which is the ſame Hiſtory with that of *Jac. Rolandus de Belebad*, Chirurgion of *Saumur*, who publiſht it in French under the Title of *Agloſſo-Stomographia*, which is by our Epnemeriſt turned into Latin.

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* *See the Noble* Robert Boyle *in his Vſefuln. of Nat. Phil Vol.* 1. *publiſht* 1663. *part.* 2. *ſect.* 1. *p.* 14. *where, by his own Experiment, Frogs did ſwim, after their hearts were cut out.*

Beſides theſe Authors, we are concerned to take notice of thoſe Generous perſons of *London,* who ſhew their Love to their Country by deviſing, propoſing and ſolliciting the beſt Expedients for the Improvement of *England* and other his Majeſties Dominions, by Trade, Agriculture, or any Commerce, Artifice, or Manufacture. At preſent I ſhall only name two:

The *firſt* is, *Englands Intereſt and Improvement, conſiſting in the Increaſe of the Store and Trade of this Kingdom*, by SAMUEL FORTREY *Eſquire.* Which Tract was firſt publiſhed A. 1663; and is again newly addreſſed to his Majeſty. In two or three ſheets it contains, *I think*, a great Treaſury.

And *ſecondly*, as a principal branch of *Englands* Treaſury we muſt recommend, *A Diſcourſe of the* FISHERY, *briefly laying open not only the* ADVANTAGES and FACILITY *of the Undertaking, but likewiſe the abſolute* NECESSITY *of it, in order to the Well-being both of the King and People; aſſerted and vindicated from all material Objections, by* ROGER L'ESTRANGE *Eſquire.* In one ſingle ſheet he ſaith, *in our opinion*, more to the purpoſe than ſome would have done in a large Volum.

Let me add, on this occaſion, in reference to *Georgicks*, that ſome have had the boldneſs to affirm, that there is ſurer and more uſeful Phyſiology in Learned *Varro*'s three books *De re Ruſtica*, than in *Ariſtotle*'s eight Books *Phyſicorum*, or in *Plato*'s intricate Sublimities. And we have not been wanting, upon occaſions to caſt in our ſmall mite, in recommending the Culture of Gardens, n. 45. n. 46. n. 53. n. 84. Vineyards, n. 15. Cider-Orchards, Groves, the Improvements of Foreſts, Mulberries, n. 2. n. 5. n. 12. n. 53. Agriculture in general, n. 5. Granaries, to provide corn in times of plenty for years of dearth, n. 25. Remedies or Preventions of Dearth propoſed, n. 90. The ſalubrity of an unwholſome place, how to be recover'd, n. 66. Sand-flouds by land, how to be ſtopp'd, and improvements in ſuch places, n. 37. Salt, how made in the coaſts of *France* by the Sun, n. 51. The Salt-works at *Nantwich* deſcribed, n.53. and 54. Tidings of a Salt-rock in *Cheſhire*, n.66. Materials for Ships offer'd from *Virginia*, to preſerve the Timber of *England* againſt a time of need, n.93. And ſuch extraordinary Artifices, as Ingenious Travellors have communicated to us. Our aim being for the general benefit of Mankind, it is fit, we ſhould begin at our own dores, and offer an Example, or, at leaſt, follow the beſt.

Errata in *Numb.* 100.

Pag. 6194. l.26. r. *reaſons of Sounds*. p.6197. l. 2. r. *proportion half of the double.*

LONDON,

Printed by T. R. for *John Martyn*, Printer to the *Royal Society.* 1674.

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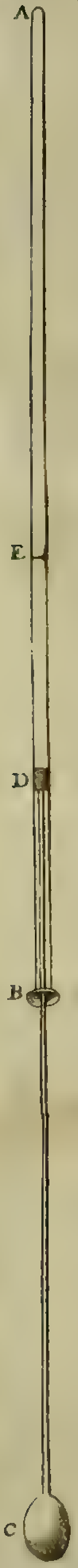

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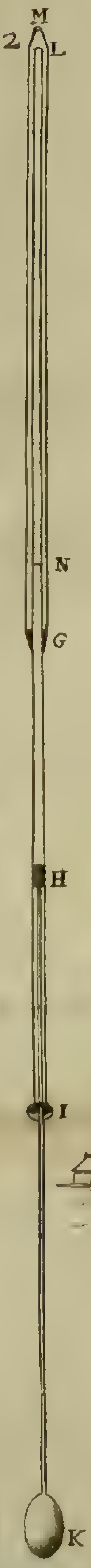

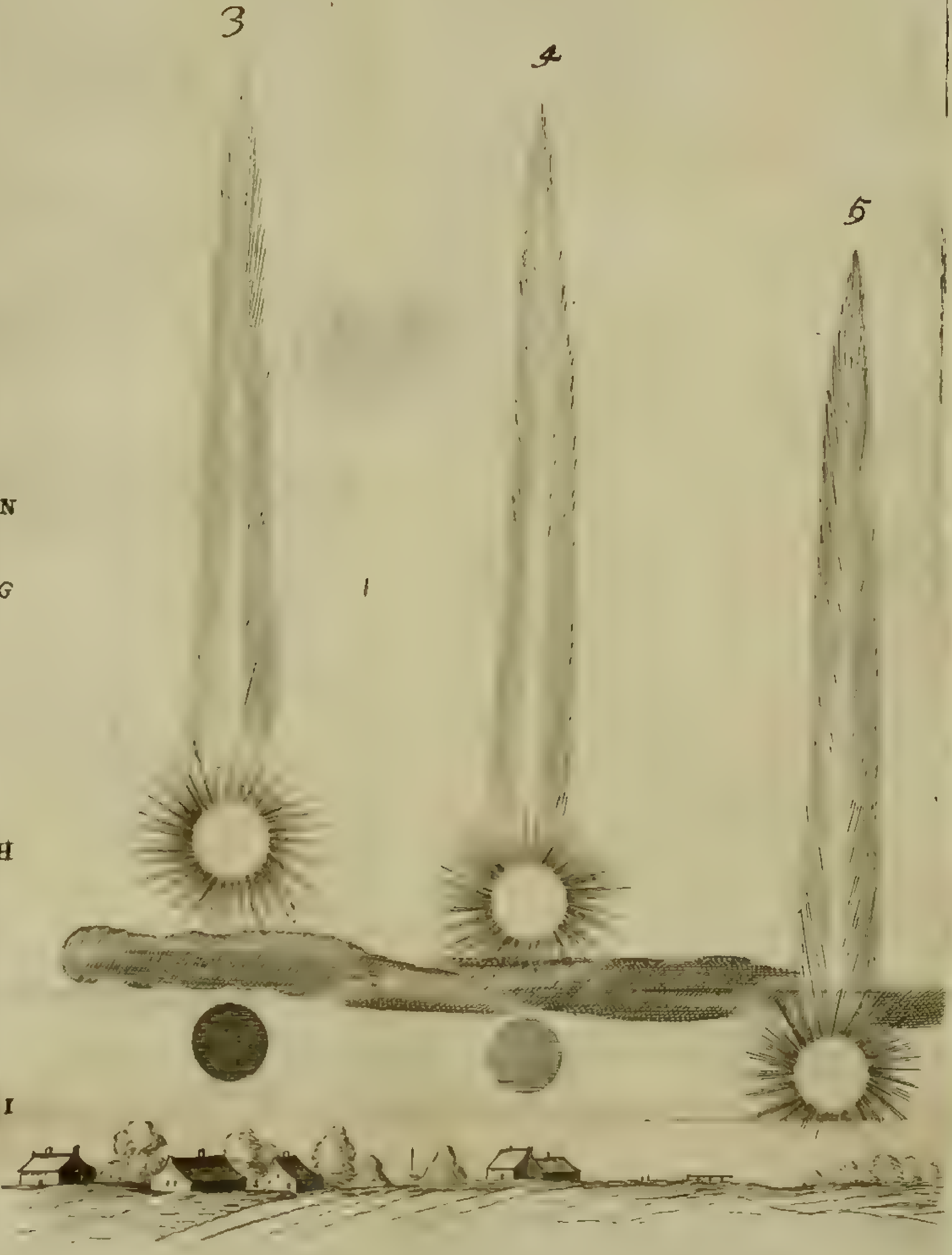

USEUM
ISTORY.

PHILOSOPHICAL TRANSACTIONS.

April 27. 1674.

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Conſiderations of Mr. Leewenhoeck, *touching the Compreſſion of the Air; ſent to the Publiſher in his Letter of* Auguſt 15. 1673.

I Cannot forbear to give you my thoughts concerning the Compreſſion of the Air. I take a narrow glaſs-pipe, as here (in *Fig.*1.) A B, hermetically ſealed above in A; which pipe I fill about half full of water, as E B: Into it I inſert the forcer D C, which is a wire, wound about at D with a piece of leather fitted into the glaſs-pipe, but firſt thruſt into hot Candle-greaſe, that ſo neither Water nor groſs Air

may

may paſs through it. The water which is in E B, is by the Forcer D C forced up, whereby the Air, that is between A and E, is compreſſed into an hundred times leſs room than it hath before this preſſure. And, foraſmuch as 'tis certain to me, that no Body can be brought into leſſer Dimenſions than it is, except ſome other body be at the ſame time diſlodged out of it, nor any Body made bigger, but ſome other bodies muſt come into it; the Air therefore cannot be compreſs'd together, and be made an hundred times leſs, but the Air muſt permeat the Glaſs; as 'tis alſo the common opinion, that the firſt and ſubtileſt ſtuff of the Air paſſes through all cloſe Bodies. I conceive then, that the firſt and fineſt matter of Air conſiſts of ſomething like grains of Sand, taking it from the fineſt ſort to the groſſeſt; its ſecond matter, of ſomething like Bodies between the groſſeſt Sand-corns and Strawberries; its third matter, of ſomething like Bodies between Straw-berries and Cherries; and that all theſe parts are ſoft and fluid. I ſay then, that if the particles of the firſt ſtuff alwaies paſs through the cloſeſt bodies (which I here ſuppoſe to be Sand-grains) it muſt follow, that by my preſſure in the Glaſs-pipe I force through the Glaſs divers particles of the ſecond ſtuff (they being all fluid) and compreſs cloſe together the more diſtant ſecond and third ſtuff, and make them change their figure, and even, in caſe there be any of the firſt ſtuff latitant in the ſecond and third ſtuff, I cauſe it by the forcible preſſure to be diſlodged together, and to paſs through the Glaſs. This preſſure is greater than many imagine. The diameter of my Glaſs being of about $\frac{1}{10}$ of an inch; if by my preſſing at C I uſed the force but of 25 *lb.* weight, it follows, if I had a Glaſs-pipe of a whole inch diameter, it would, to keep proportion with a Glaſs-pipe of $\frac{1}{10}$ inch, require a force of 2500 pounds.

Theſe things thus ſuppoſed, being deſirous to try, whether any particles of the ſecond ſtuff, or other parts ſomewhat bigger than the ſmalleſt ſtuff, could be preſſed or forced through the Glaſs; I prepared for that purpoſe another Glaſs-pipe (as *Fig.* 2.) and took a third one of half its length, and ſo much wider, as to ſhoot over the ſecond, as here G M: Which wider pipe I cloſed to G by means of the fire, leaving it open at the end M with a hole as ſmall as a hair, imagining, that if by the Forcer K H I ſhould force up towards L the water that is between I N, that then the particles driven out of the inner-Glaſs, and being bigger than thoſe which by the continual Ethereal motion paſs through it, and paſſing into the exterior Glaſs, would there require more ſpace, and conſequently drive out ſome Air at the little hole in the exterior pipe at M: And to ſee the event hereof, I did put in the outermoſt part of the ſmall hole M a little water, which filled the hole only on the foremoſt part of it, thinking, that as I ſhould drive the Air out of the innermoſt Glaſs, the ſame paſſing into the exterior Glaſs, would thruſt the water out of the little hole. But what motion ſoever I make with the Forcer K H, and preſs out the Air N L, the water at the ſmall hole M keeps its ſtation; and yet, if I do but apply my warm hand to the exterior pipe M G, the water at M preſently flies out. This puzles me, nor can I find a ſatisfactory reaſon for this *Phænomenon*.

More Microſcopical Obſervations made by the ſame M. Leewenhoeck, *and promiſed in* Numb. 97. *of theſe Tracts*; *Communicated in his Letters of* Auguſt 15. 1673 *and of* April 7. 1674.

1. I Have divers times endeavoured to ſee and to know, what parts the *Blood* conſiſts of; and at length I have obſerv'd, taking ſome Blood out of my own hand, that it conſiſts of ſmall round globuls driven thorough a Cryſtalline humidity or water: Yet, whether all Blood be ſuch, I doubt. And exhibiting my Blood to my ſelf in very ſmall parcels, the globuls yielded very little colour.

2. I have likewiſe obſerv'd ſome of the ſweet *Milk* of Cows, and find that alſo to be made up of ſmall tranſparent globuls, carried in the ſame manner as in the Blood thorough a clear liquor.

3. I have alſo viewed in my Microſcope ſome of the *Hair* of my own Head, which heretofore I imagined to have ſeen to grow out of globuls, that are not driven out to the end, as I obſerved it was done in Trees and Plants, but that they united in the skin, and in the root of the hair; ſo that Hair grows

and increaſes by the protruſion of globuls. But two or three days agoe I obſerved the Hair of an *Elk*, and found it wholly to conſiſt out of conjoyned globuls, which by my Microſcope appear'd ſo manifeſtly to me, as if they could be handled. And therefore having ſo clearly ſeen thoſe globuls, I aſſure my ſelf, that the growth and increment of Hair is made (as I ſaid juſt now) by the protruſion and driving on of globuls. This hair of the *Elk* I find to be within much hollower, than that of Men or of other Animals. †

† *See Mr.* Hook *of this ſubject in his* Micrography, *Obſ* 32.

4. Again, I alſo obſerv'd a *Nail* of my hand, and found it likewiſe to be made up of globuls, not doubting but that it alſo grows from globuls protruded.

5. Beſides, I have obſerv'd the *Udder* of a Cow, in which, I believe, the Milk is made; as alſo the *Fat* of ſome Cattle and Fiſhes, the *Sinews* of a Cow, the *Fleſh*, the *Film* wherein the fleſh is wrapp'd up, the Veſſels and the Fat of the Film, and the *Cuticula* of our Body; but, being not now at leiſure to deſcribe my obſervations of them, I muſt refer it to another opportunity.

6. Having formerly ſpoken of the *Lowſe*, her ſting, &c. * I cannot here omit to ſay ſomething of what I have ſeen *within* that Creature. I have ſeveral times put an hungry Lowſe upon my hand, to obſerve her drawing blood from thence, and the ſubſequent motion of her body, which was thus: The Lowſe having fixt her ſting in the skin, and now drawing blood, the blood paſſeth to the fore-part of the head with a fine ſtream, and then it falls into a larger round place, which I take to be filled with Air. This large room being, as to its fore-part, filled about half full with blood, does then propel its blood backward, and the Air forward again; and this is continued with great quickneſs, whilſt the Lowſe is drawing the blood; except, that at times ſhe ſtops a little, as if ſhe were tired, and recollects her ſelf; (a motion like that, it ſeems, which is in the mouth of a ſucking Infant:) From thence the blood paſſeth in a fine ſtream into the midſt of her head, that being alſo a large round place, where it hath the ſame motion. Hence it paſſeth in a ſubtile ſtream to the breaſt, and thence into a gut,

* *See Mr.* Hook *in his* Micrography, *Obſ*. 54.

which goes to the hindmoſt part of the Body, and with a curvity bends a little upwards again. In the breaſt and gut the blood is without intermiſſion moved with great force, and eſpecially in the Gut, and that with ſuch ſtrong beatings downwards, and with ſuch a retrocourſe and contraction of the gut, that a curious Eye cannot but admire that motion. In the upper part of the crooked aſcending Gut, which is very ſtreight, now and then a little blood crowds thorough, which returns not back (and here, I preſume, is a little *valve:*) The blood, that is thruſt thorough here, ſtands ſtill, and ſoon receives another nature, becoming of a watery colour; and in this watery liquor there do appear ſome blackiſh ſandy particles, having a confuſed motion, which grow in bigneſs, and being grown ſo great as ſand is to our Eye, the ſaid particles joyn themſelves cloſe and firm together, as it were, in one maſs, and then ſhoot down to the *anus*, carrying with them, in caſe the Lowſe have much Blood in her body, a little aqueous blood. Theſe excreted particles appear like the excrement of a Silk-worm.

Sir Samuel Morelands *undertaking for raiſing of Water.*

WHereas the Common and received opinion through *England* and all *Europe* hath been and is, That, if a given Weight will force up water 20 foot high, there muſt be *more* than twice that weight to force it up 40 foot, and *more* than thrice that weight to force it up 60 foot, and ſo by a Geometrical proportion *in infinitum:* And likewiſe, that a Barrel of a Pump, 6 inches wide, doth not require a pipe, through which the water muſt be drawn up, above $1\frac{1}{2}$ inch, or two inches, at the moſt, in diameter:

Sir *Samuel Moreland* undertakes to demonſtrate, 1. That he will force Water 60 foot high with treble the weight that ſhall raiſe it 20 foot, and ſo proportionably *in infinitum.* 2. That by how much wider the Barrel is, in which the Forcer works, than the Pipe through which the water is forced up, by ſo much is the Engin preſſed with unneceſſary weight.

A Note about ſome un-uſual Diamonds.

THere came to our hands, ſome while ſince, a Repreſentation of a conſiderable number of excellent Diamonds, ſold by one Monſieur *Tavernier* to his King, after his laſt return from the *Eaſt-Indies*, whither he had made ſix Voyages by Land. Amongſt theſe Diamonds there are deſcribed three of a very unuſual colour; one, weighing $112\frac{3}{16}$ *Carats*, of a very fine Violet-colour, and two of a Roſe-pale colour; all three of an Adamantin hardneſs, and upon that account eſteemed *Diamonds.*

A certain Phænomenon, ſeen by Monſieur Hevelius, *Feb.* 5. 1674. St. No. *not far from* Marienburgh *in* Boruſſia, *about the Sun, a little before his ſetting and the Moons conjunction, and the Suns Eclipſe, (which yet was not ſeen by him.)*

I Saw at that time (*ſaith the Obſerver*) the Sun, in a sky every where ſerene enough, being yet ſome degrees above the Horizon, and ſhining very bright, yet lancing out very long and reddiſh rays, 40 or 50 degrees toward the Zenith (as appears *Fig.* 3.) Under the Sun, towards the Horizon, there hung a ſomewhat dilute ſmall Cloud, beneath which there appear'd a Mock-Sun, of the ſame bigneſs (to ſenſe) with the true Sun, and under the ſame Vertical, of a ſomewhat red colour. Soon after, the true Sun more and more deſcending to the Horizon, towards the ſaid Cloud (as may be ſeen *Fig.* 4.) the ſpurious Sun beneath it grew clearer and clearer, ſo as that the reddiſh colour in that apparent Solar disk vaniſh'd, and put on the genuine Solar light, and that the more, the leſs the genuine disk of the Sun was diſtant from the falſe Sun: Till at length the upper true Sun paſſed into the lower counterfeit one, and ſo remained alone; as appears *Fig.* 5.

Which Appearance being unuſual, and having never been ſeen by me, I took the freedom of imparting it unto you, eſpecially ſince here the Mock-Sun was not found at the ſide of the true Sun, as 'tis wont to be in all *Parhelia's* ſeen by me, but perpendicularly under it; not to mention the Colour, ſo different from that which is uſual in Mock-Suns; nor the great length of the Tayl, caſt up by the genuine Sun, and of a far more vivid and ſplendid light, than *Parhelias* uſe to exhibit. Upon this appearance there ſoon follow'd here an exceedingly intenſe and bitter Froſt, whereby the whole *Sinus Puzenſis* was frozen up from this Town of *Dantzick*, as far as *Hela* in the *Baltique* Sea, which laſted unto the 25*th* of *March*; and the Bay was frozen ſo hard, that with great ſafety people run out into it with Sleds and Horſes, for ſeveral of our Miles. Whether the recited Phænomenon have had any influence for this extream Cold, I know not, but leave it for Aſtrologers to examine. Whether the like Appearance have ever been obſerv'd in *England*, I ſhould be glad to be informed of.

An Extract of Monſieur *Hevelius*'s Letter, lately written to the Publiſher, concerning the famous *Kepler*'s Manuſcripts; together with ſome conſiderations of his, about the uſe of *Teleſcopic Sights* in *Aſtronomical* Obſervations: Delivered in the ſame language, wherein 'twas written.

——EX *tuis* 16 Septemb. *datis intellexi, Te pleniorem informationem de* Kepleri *Manuſcriptis deſiderare. Jam ante hac, nî fallor, ad Vos perſcripſi, me omnia* Kepleri *MSS. ab hæredibus certo pretio obtinuiſſe, tum opera jam edita, tum quædam hactenus inedita; inter cætera, ipſa Epiſtolarum omnium (quarum magnus numerus) ad Clariſſ. Viros ſcriptarum Autographa, cum plurimorum illius temporis Illuſtrium Virorum reſponſionibus. Inter MSS. illa inveniuntur ſanè quæ lucem merentur, non ſolùm plurimæ Epiſtolæ, ſed & Opera quædam, inter quæ eminet ejus* Hipparchus, *quanquam non ſit, ut par eſt, digeſtus; qui tamen poſſet, à quopiam harum rerum perito & otio abundante, facilè in ordinem redigi & abſolvi. Poſſideo itidem ſcripta ejus Chronologica. At* Kepleri *vitam ſtudio conſcriptam non invenio; interim plurima notata digniſſima, vitam ejus ſpectantia, paſſim notavi, ex quibus Vita ejus poſſet haud obſcurè depingi. Quæ verò in ſpecie ex ſcriptis ejus penes me habeo, Catalogus hicce*[*] *indicabit. Ceterùm percipio, Veſtrates non omnes mihi adſtipulari in iſto* Dioptrarum *negotio, de quibus in* Machinæ meæ Cœleſtis Organographia *tractavi. Verùm, etiamſi Cl.* Hookius, *& Cl.* Flamſtedius[†], *aliique, planè aliter ſentiant, experientiâ tamen quotidianâ me edocuit, atque etiamnum docet, rem longè aliter ſe habere in Magnis illis Organis,* Quadrantibus *ſcilicet,* Sextan-

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[*] Vide infra.

[†] Vid. N°. 96. pag 6000. ubi *Flamſtedius* dubitat, an multùm emendatiores locos in Fixarum reſtitutione habituri ſimus ab illo, qui nonniſi pinnacidiis vitrorum caſſis utitur. *Huc enim ex parte reſpicit hujus Epiſtolæ Author.*

tantibus & Octantibus, *inprimis* Quadrantibus Azimuthalibus, *aliiſque Quadrantibus regulis conſtructis, quæ nempe adeò procliviter commoveri & inverti (dum examinantur Dioptræ* Teleſcopicæ*) imò nullo modo poſſunt, ut quidem Inſtrumenta illa trium quatuórve pedum perpendiculo conſtructa. Res cumprimis in eo conſiſtit, quòd nullam planè obſervationem ſuſcipere poſſint ſuis Dioptris* Teleſcopicis, *niſi priùs denuò eas examinent, & rectificent; in quo tamen examine variâ viâ, idque jugiter, ut ut ſtudioſiſſimè illud ſuſcipias, hallucinari datur. Adhæc, in Quadrantibus Azimuthalibus, Octantibus & Sextantibus, quâ ratione examen illud omni tempore, commodè, & ſine magno temporis diſpendio inſtitui poſſit, profectò nondum capio. Vix mihi perſuadeo, ullibi hactenus ullum Aſtronomicum Inſtrumentum aliquod magnum, ſex vel novem pedum, utpote* Sextantem, Octantem, *vel* Quadrantem *cum Regula, vel* Quadrantem Azimuthalem, *cum pinnacidiis Dioptricis conſtruxiſſe, eúmque ad Cœlum felici aliquò ſucceſſu adhibuiſſe, ſolidique quicquam obſervaſſe. Si tentaſſet, ac per annos aliquot Obſervationibus invigilaſſet, ſine dubio aliter ſentiret. Hoc enim negotium non tantùm in hoc conſiſtit, quòd Stellæ aliquanto diſtinctiùs conſpiciantur; (quanquam Fixæ ab eo, qui viſu pollet & exercitatus eſt, æquè bene nudis oculis diſcernuntur,) ſed an Inſtrumenta ab omni parte correctè commonſtrent, an pinnacidia Teleſcopica Inſtrumentis toties ad quaſvis Obſervationes ritè imponi, & tutò conſervari queant; de quibus quidem id omni tempore æquè præciſè fieri poſſe, valdè dubito.*

Quarè Cl. illos Viros humaniſſimè rogatos volo, niſi jam vaſta ejuſmodi Organa, Sextantem *putà,* Octantem & Quadrantem Azimuthalem, *Dioptris Teleſcopicis munita poſſideant, eáque Cœlo continuò admoveant, judicium ſuum tamdiu ſuſpendant, donec longâ annorum ſerie experti fuerint, non fuiſſe ſe multoties eluſos. Ex una quippe alteráve Obſervatione, Quadrante aliquo, leviori perpendiculo gaudente, acquiſitâ, res hæc nequaquam eſt decidenda: Sed, ſiquis per decem & ampliùs annos aſſiduè obſervaverit, tum ab ovo ſeriam Stellarum Reſtitutionem per diſtantias ſuſceperit, poterit certiora quædam hac de re in medium proferre. De reliquo ſatis mirari nequeo, eos qui ejuſmodi Dioptris Teleſcopicis gaudent, necdum locorum, ubi degunt, & obſervant,* Elevationem Poli, *quantum ſciam, rectè & omninò præciſè determinaſſe. Hucuſque enim ad aliquot minuta integra* Pariſiis *Elevatio Poli nondum eſt definita; uti ex Diſſertatione* Petri Petiti *de Latitudine* Lutetiæ *intelligi poteſt.*

Sed nolo in his eſſe prolixior; ad Obſervationes ipſas provoco: Tempus aliquando docebit, quorum Obſervationes univerſæ accuratiores fuerint, ſi modò nonnulli cenſuram ſuam rejicere eouſque poſſent. Video enim aliquos, (inter quos etiam Cl. Flamſtedius *invenitur, ut ex epiſtola ejus ad Dom.* Caſſinum *apparet) tuliſſe jam de noſtris Obſervationibus, qualibus qualibus, judicium, priuſquàm illas viderunt, examinarunt, vel quicquam de iis cognoverunt. Nolo quidem vanus eſſe rerum mearum jactator, nec unquam imaginatus mihi fui, me in omni iſto negotio, Reſtitutionis ſcil. Fixarum,* *rem acu omninò tetigiſſe, aut tangere pro mea tenuitate poſſe: Sed hoc mihi penitùs imaginor, ſiquidem totum illud negotium ſuſcepiſſem Dioptris* Teleſcopicis, *mihi non ſolùm plurimos annos examinibus terendos, ſed & ſpe, ſine dubio, variâ viâ, (qua de re hîc non eſt diſſerendi locus) cadendum fuiſſe. Exinde gratulor mihi, me ad ſententiam illam necdum tranſiiſſe, meáque me methodo omnia perfeciſſe quicquid præſtitum Dei beneficio fuerit. Interim utrum nihil amplius (uti dubitat Cl.* Flamſtedius *) quàm hactenus præſtitum fuerit, necne, de eo liberum cuique erit, ſuo tempore, quando rem viderit, judicium ſuum exponere; quin imò integrum erit, alium novum Catalogum ſuperadditis tot ac tot centenis novis Fixis, hactenus neglectis, aliâ ratione conſtruere. Verùm nondum video, curam hanc moleſtiſſimam, tædioſiſſimam, laborioſiſſimamque, quæ non niſi multorum annorum vigiliis ſuſcipi peragique poteſt, ullum aliquem Aſtronomum ſeriò hactenus tangere. Certè, unam alteramve ſtellulam ope Teleſcopii, Dioptrarumve Teleſcopicarum, dum præcipuas ac majores Fixas earumque intercapedines ſupponimus correctas, ad debitum locum deducere, tum nonnunquam diſtantias nonnullas Stellarum capere, hæc ludicra ſunt: At, reſtituere omnes conjunctim ſecundùm longum ac latum; tum ductu continuo, ſingulis ſerenis diebus ac noctibus, tam Altitudinum Solarium, quàm reliquarum Stellarum obſervationibus operam dare, eáſque Orbi exponere, ut pateat Motuum Harmonia, atque Inſtrumentorum certitudo; hoc artis, hoc laboris eſt. Quando Obſervationes habebimus* 20 *&* 30 *annorum ſpatio continuatas utrinque, nimirum tum quæ Dioptris Teleſcopicis, tum quæ ſolummodò Noſtris de Cœlo depromptæ fuerint, res omninò clarior futura eſt. Interea ſuo quilibet ingenio fruatur rémque ſuâ ratione pro libitu tentet. Honorificum nobis omnibus erit, rei Literariæ incrementum pro modulo noſtro, nobis à DEO conceſſo, variâ viâ promovere.*

Johannis Kepleri, Mathematici ſuo ſæculo Clariſſimi, Manuſcripta, in proximè prægreſſis literis laudata.

FAſciculus primus *continet*, *Reſtitutionum* Lunarium *Adverſaria*, *& Demonſtrationes pulcherrimas multas, & librum, cui nomen feci* Hipparchus, *ſeu, de Magnitudinibus & Intervallis trium Corporum,* Solis, Lunæ, & Telluris; *ubi plus ferè admirationis meretur Ingenium Humanum, ad cognitionem Dei operum viam moliens, quàm Opera ipſa Naturæ per ſe bruta. Hæc* Pragæ *inchoata à multis annis,* Lincii *verò magnâ parte continuata.*

Faſc. 2, 3, 4, 5, *6. continent varias Virorum Magnorum ad* Keplerum *Epiſtolas, diverſis argumentis Mathematicis aliiſque refertas, quarum nonnullæ ſcriptæ fuerunt ad Reges, Principes & Status, putà* Jacobum *M. Brit. Regem*, Landgravium Haſſiæ, Principem Anhaltinum, Ducem Wirtenbergenſem, Status Auſtriacos, &c; *aliæ ad Univerſitates, & primarios, ipſi coævos, Aſtronomos, Academiam nempe* Tubingenſem, Tychonem Brahe, Galilæum, Harriottum, Crabbium, Forſiium, Briggium, Beyerum, Origanum, Scheinerum, Beſoldum, Mæſtlinum, Berneggerum, Hofmannum, Piſanum, Brunum, Dornavium, Chriſtmannum, Daſipedium, Wittichium, Velſerum, Tengnagelium, Barthium, Crugerum, Schickardum, Mullerum, Maginum, Malcotium, Stolzelium, Calviſium, Scaligerum, Piſtorium, Hafenrefferum, Smidium, Rulandum, *&c.*

Faſc. 7. *habet* Πορφύειον εἰς τὰ Ἁρμονικὰ Πτολομαίου ὑπόθεσις, *Græcè: It.* Kepleri *appendicem ad Harmonices Mundi* lib. 5. *continentem* Ptolomæi *lib.* 3. *cum Notis antehac non viſis*: Item, *Confutationem trium Capitum, quæ tribus ultimis Inſcriptionibus tertii libri Harmonicorum* Ptolomæi *ſubjuncta ſunt*, Boſſloami Monachi, *Interprete* Joh. Keplero: It. Ptolomæi *Harmonicorum ſive de Muſica*, Andreâ Gogavico *interprete*: It. *De Muſica veteri & moderna ex Dialogis* Vincentii Galilæi: It. Ariſtoxeni, *Muſici antiquiſſimi, Harmonicorum Elementorum libros* 3. It. Ptolomæi *Harmonicorum lib.* 3. It. *Artis de Objecto Auditûs fragmentum ex* Porphyrii *Commentariis.*

Faſc. 8. *continet Genealogiam* Auſtriacam *&* Procerum.

Faſc. 9. *habet Commentarium in* Martem *Manuſcriptum, diverſum ab edito, cum multis Schematibus, magnum Volumen*: It. *Explanationem eorum quæ reſtant ad Commentarium.*

Faſc. 10. *continet Geometrica multa.*

Faſc. 11. *Rudimenta Calendarii de Aureo numero*: It. *Dialogum de Calendario* Gregoriano, Germanicè: It. *Tractatum de forma Anni in Tabb.* Rudolphinis *adhibita*: It. *Dialogum de Calendar.* Gregoriano: It. *Propoſitiones ab Imperatore exhibitas tribus Electoribus, Confeſſionem* Auguſtanam *profeſſis, circa negotium Calendar. eorumque ſenſa de iſtis propoſitionibus*: It. *Calendarium ipſum.*

Faſc. 12. *Tabulas Indic. Logarithm.* It. Boſſloami Monachi *logiſticam*: It. *Canonem Meſolog. dilatatum*: It. Coſſam Burgii *excultam*; *ubi ratio nova duplex Canonis Sinuum adornandi*; *ratio compendioſè quadrandi, & radicem extrahendi*; *adhæc, Locatio Epocharum audax, cum reſtitutione* ♀ *&* ☿; *cum cumpluribus aliis.*

Faſc. 13. *Chronologiam ab initio Mundi*: It. *De* 70 *hebdom.* Danielis *Diatribam*: *Annotata ad annos* Buntingii: *In* Sleidanum *de* 4 *Imperiis*: *De origine Gentium ex hiſtoria* Moſis: *Chronologica plura, ut & Notas ad* Scaligeri *Diatriben de Æquinoctiis.*

Faſc. 14. *De Stella nova* Kepleri *Annotata, in Cygno apparente, cum plurimis Epiſtolis.*

Faſc. 15. *Annotationes in* Dionyſii Petavii *Doctrinam Temporum.*

Faſc. 16. *Rudimenta Tabularum ſpectantium Planetas* ♃.♄.♂.♀.☿.

Faſc. 17. *Demonſtrationes motuum* Saturni *cum* Tabb. *& Reviſionem Excentricitatis, ut & proportionem Orbium & Diſtantiarum*: It. *Demonſtrationem motuum* Jovis *cum* Tabb. *quibus acceſſit Examen proportionis Orbium & excentricitatis abſolutum*: It. *Tabulas* Martis, *& partem præceptorum utendi, & Computationes locorum Veterum pro Epochis*: *Demonſtrationes motuum* Veneris: *Tabulas Indic. pro* Mercurio: *Tabulas* *anguli pro* Mercurio: *Demonſtrationis motuum Mercurii rudimenta omnifaria*: *Repetitionem Mercurialium.*

Faſc. 18. Lunaria *Tychonis Brahe*, *ſive Progymnaſmatum partem*: It. *Autographum Transformationum Lunarium*: It. *Transformationem hypotheſeos*, *&* Tabb. *Lunarium.*

Faſc. 19. *Obſervationes Eclypſium* Kepleri, *& aliorum*: It. *Ad motuum* Lunæ *Reſtitutiones pertinentia, cum Epiſtolis, & Eclipſibus Lunæ.*

Faſc. 20. *continet Obſervationes* Keplerianas.

Faſc. 21. *De Anni quantitate, æquinoctiis, obliquitate Eclipticæ, æquatione temporis*: It. *Contra Obliquitatem Eclipticæ olim majorem ex obſervatione Chaldæorum*, Timocharis *&* Ptolomæi; *contra inæqualem Præceſſionem Æquinoctiorum, Obſervationes* Waltheri *examinatæ*; *& ex iis de Æquatione ſeculari*: It. *Ad æquationum negotium pertinentia, & de Diverſitate longitudinis Anni ex cauſis Phyſicis.*

Faſc. 22. *De Stellarum in Firmamento diſtantiis.*

Faſc. 23. *Genethliaca*: It. *Diverſas* Tabb. *motuum Lunarium*: Bartſhii *Uranographia*: It. *Themata Clar. Virorum*: It. *Genethliaca Tychonis Brahe.*

Faſc. 24. *Tabb.* Rudolphinarum *Autographum.*

Faſc. 25. *Geometrica & Aſtronomica, putà de Quantitatibus; de divina Proportione; an recta curvis æquent*, &c.

Faſc. 26. *Alia Geometrica & Aſtronomica.*

Faſc. 27. *Genethliaca*: It. *De Regni* Turcici *interitu, in* Roſhei *lib. Commentarium.*

Faſc. 28. *Fundamenta Aſtrologica.*

Faſc. 29. *Hydranlico-Pneumatica*: It. *Tractatum contra* Urſum; *nec non literas Tychonis Brahe ad* Keplerum, *& vice verſâ, ſpecialiſſima continentes*: It. *Teſtimonia & Contractus inter ipſum & Tychonem*: It. *Ad Imperatores & Magnates literæ.*

An Accompt of ſome Books.

I. *Johannis Schefferi* LAPPONIA, *&c. Francofurti* 1673. in 4°.

THE Author of this Hiſtory, glorying in the *Preface*, that he is the firſt that hath truly diſcover'd *Lapland* and its Inhabitants to the World; and there being not yet tranſported hither any conſiderable number of Copies, to ſatisfie the Curioſity of the Inquiſitive: We ſhall here the more largely and particularly repreſent the principal Contents of this Book, as far as 'tis conſiſtent with the deſign and buſineſs of theſe Tracts.

Firſt then, He giveth us the *Scituation* and *Climat* of this Country, informing us, That as far as 'tis ſubject to the

Crown of *Sweden,* it is ſcituate between the *Latitude* of 64 and 71, and the *Longitude* of about 38 and 65 deg; and that 'tis now call'd with one word, *Lapland,* which was formerly call'd by the Natives, *Biarmia,* and by Strangers, *Skrit-Finnia,* which latter Name it took from the cuſtom of the people, to *skrit*, that is, to *ſlide*, with a kind of woodden Shoes, over the Ice and Snow. As for the Temperature of the *Climat*; he obſervs, *That* in the more Northern part of *Lapland,* the Sun ſets not in Summer, nor riſes in Winter for ſome Moneths together; *that* the Moon and the abundance of Snow do by their brightneſs, in ſome meaſure, make ſome compenſation for the long nights; and *that* the Air is very ſerene and wholſom, being fanned by ſtrong winds, and clear'd in Winter by deep ſnows and hard froſts; the moſt rapid Rivers not being able to eſcape freezing to the thickneſs of two, three, and more cubits; though in Summer the Heat be exceſſive for a couple of Moneths, the Sun never ſetting for that time: Which ſeaſon not coming in till the end of *June*, the Graſs begins then firſt of all to appear, and the Trees to bud, but with that vigor, that in a Fortnights time the flowers of Herbs and the leaves of Trees arrive to their full ſize. The Soil is in ſome parts ſtony, craggy and ſandy; in others, by reaſon of the abundance of Lakes, Rivers and Rivulets, wet and mooriſh, producing ſtore of Graſs and Kitchin-Herbs.

Secondly, He deſcribes the habit both of the Body and Mind of the *Laplanders*, ſaying, That they are generally of low ſtature, yet ſome of their Women not unhandſom; the Men of a dark ſallow colour; both Men and Women lean, ſeldom any being found fat and corpulent: however they are very ſinewy, ſtrong, and ſwift in running. But as to the conſtitution of their Mind, they are exceedingly ſuperſtitious, timorous and un-warlike; whence the Author takes occaſion to un-deceive the World, that hath hitherto been perſwaded, as if that great Warrier, King *Guſtavus Adolphus*, had done his great Atchievments by *Laplanders*, and their Magical Arts. They are very ſuſpicious, deceitful, prone to anger and revenge, eſpecially the Women. Covetous they are alſo, and ſlothful, yet proud of themſelves, and deſpiſers of other Nations. That which our Author commends in them, is, that they keep the

Bond of Marriage ſacred, ſteal not, are good to the Poor, and hoſpitable enough to Strangers. They have good memories, and want not the wit of making themſelves all their own Tools, and other Neceſſaries; *viz.* their own Cloaths, Shoes, Veſſels, Inſtruments for Carriage, Hunting, Fiſhing, *&c.*

Thirdly, He enquires into the Origin of theſe *Laplanders*, and finds them to be an Off-ſpring and Colony of the *Finlanders*; which he endeavours to prove, from the affinity there is in their Languages, and from the Habit of their body, their Manners, Cuſtoms, *&c.* Here he aſſigns the ſeveral occaſions and times of their ſeveral Tranſmigrations.

Fourthly, He gives an Account of their ancient *Pagan*, and modern *Chriſtian* Religion, which latter the *Swedes* were the happy Inſtruments of, under their King *Ladislaus*, A. 1277; his Succeſſors cauſing ſome Churches to be built amongſt them, and the late Queen *Chriſtina* erecting at once no leſs than four Churches *A.* 1640, in a part of *Lapland*, where a Silver-Mine had been found out; as her Royal Father, *Guſtavus Adolphus*, had ſet up ſome Schools amongſt them about the year 1619, for the better education of Youth: Notwithſtanding which, there remain many Relicks of their ancient Idolatry, Superſtition, Sacrifices, and Magic; of which laſt, our Author treats at large, eſpecially of their *Magical Drum*, which he deſcribes *firſt*, as to its *Fabrick* and *Ornaments*, it being made either of Beech, Pine, or Firr, cleaved in the middle, and having that part, which is to ſerve for the Drum, and is in a manner of an Oval figure, excavated, and the plain ſide of it cover'd with a skin, on which are painted various Pictures, not only of their ancient Gods, and of Chriſt, and his Apoſtles, but alſo of the Sun and Stars, and various Beaſts, Serpents, Lakes and Rivers; all which are diſtinguiſhed and ſeparated into three ſeveral Regions by Lines; though others of theſe Drums be pictured otherwiſe. They have all of them an *Index* and an *Hammer*. The *Index* is a bundle of braſs or iron-Rings, of which the biggeſt hath a hole in the middle, the ſmaller ones being appendant to it; though this alſo varies in ſeveral places. The *Hammer* or Drum-ſtick is made of the Horn of a Rheen-Dear, wherewith they beat the Drum, to make the aforeſaid Rings, laid on the top of the Drum, move and dance about the Images pictur'd thereon, and at laſt to ſhew what they have a mind to be reſolved of. And the uſe they put this Drum to (which is the *ſecond* thing in our Authors deſcription of it) is, that by beating it they may explore chiefly theſe three ſorts of things; 1. What Sacrifices they ſhall beſt pleaſe their Gods with? 2. What ſucceſs they ſhall have in their buſineſs and undertaking, *e.g.* Hunting, Fiſhing, Curing of Diſeaſes, *&c.* 3. What is done in places remote from them? Concerning all which, What Ceremonies and poſtures they uſe in beating this Drum, and what meaſures they take for diſcovering their purpoſes, would be too long and too tedious to tranſcribe; though indeed the main thing of the latter, which relates to the marks of diſcovery, be kept by this people for a ſecret. Beſides this Drum, they make uſe of a *Magical Cord*, that hath three knots in it, of which when they untye one, they raiſe a tolerable Wind; when the ſecond, a much ſtronger wind; when the third, a great Storm. They ſerve themſelves alſo of *Magical Arrows*, by which they are believed to cauſe diſeaſes, pain, and other miſchief, even to thoſe that are far diſtant from them. And theſe Arts they not only exerciſe againſt ſtrangers, but alſo againſt one another; concerning which, here is related an odd example of one, that excelling in Magic, could not be overcome by his Adverſary, how skilful ſoever in the ſame Art, till he, being found a ſleep under a Rock, was kill'd by his Enemies craft, breaking that Rock and throwing it upon him.

Fifthly, He treats of their Government and Judicature, both ancient and modern; of which to diſcourſe here, is beſides the ſcope of theſe Papers.

Sixthly, He particularizes their Trade, conſiſting in Fiſh, and Furrs, as the skins of *Ermins*, black, blewiſh and white *Foxes*, *Rheen-Dear*, Shoes and Boots, and Cheeſe of their *Rheen-Dear*, &c. which Commodities they exchange for Rixdollars, for linnen and woollen Cloth, for Copper, Braſs, Salt, Flower, Brimſtone, Pins, Needles, Knives, Spirit of Wine, and Tobacco.

Seventhly, He informs us of the *Language* of the *Laplanders*, which he affirms to have a great affinity with that of the *Finlanders*, as the People from whom they are deſcended.

Eightly, He diſcourſes of their *Houſes*, *Dreſs* and *Victuals*. As to the firſt, he ſaith, that though formerly they tranſported their Manſions from place to place, according to the exigency of their lively-hood; yet they have been of late by publick Edicts reſtrain'd from that vagabond kind of life to more fixed places and Territories, large enough to furniſh each Family with Neceſſaries for life. Touching their *Dreſs*, he notes, that 'tis ſtraight, and fitted to the ſeveral parts of the Body, that ſo it may not trouble or hinder them: The ſtuff of it is largely deſcribed by the Author. Their *Victuals* are different according to the difference of the People, of which ſome live in Mountainous places, ſome in Plains and Woods. The former live almoſt altogether upon their *Rheen-Dear*, and their Milk, Cheeſe and Fleſh; which laſt they dry by expoſing it for a good while to the hard Winter-froſts, and ſo eat it, thoſe froſts ſubduing the rawneſs of it little leſs than in other places the heats of the Sun do: The *latter* feed upon Fiſh, Fowl and wild Beaſts, eſpecially Bears-fleſh, which is their greateſt delicacy. Bread and Salt is unknown to moſt of them; they uſing for *Bread* dryed Fiſh, beaten to powder, and for *Salt* the Inner bark of Pine-trees, prepar'd after this manner, *viz.* They un-bark the talleſt of thoſe Trees, eſpecially that part which is next to the ground, and take of it the inner bark, whoſe ſeveral coats they part aſunder, and expoſe them, well clean'd, to the Sun, to dry: Then they tear them into ſmall parts, and put them into pretty big Boxes, made of the outer bark of Trees. Theſe Boxes they dig under ground, and cover them with ſand, and ſo let them be macerated for a whole day by their own heat. Then they make upon thoſe Boxes a great fire of blocks of Trees, by which thoſe inner Rinds acquire under ground a red colour, and a grateful ſweetiſh taſte, ſerving them for a condiment, and ſupplying the place of Salt. Amongſt their Herbs, they make much of the *Angelica petroſa*, by roaſting the unskinned ſtalk thereof, before it runs into Seed; which though bitter, yet is pleaſing to them, becauſe they are accuſtom'd to it, and know it to be conducive to health. As to their *Drink*, they uſe common Water, and ſuch broth wherein Fiſh and Fleſh have been boiled.

Ninthly, He deſcribes their *Hunting*, and the Inſtruments belonging thereto; as alſo the Manual practices of their Men and Women, and their Recreations, Plays, and Marriages. They never go a *Hunting*, without having firſt explored the favour of God by their Magic Drum, and they judge it very unlucky, if any Woman meet them when they go to that exerciſe, in which their chief Game are the *Rheen-Dear* and *Bears*; the former ſerving them both for Horſes, and Meat and Cloaths; the latter, for Feaſting and Rejoycing, there being nothing more glorious to a *Laplander*, than to have killed a Bear. Amongſt their *Inſtruments* of Hunting, they uſe Bows and Arrows; their wooden Bows, having the two pieces they conſiſt of, joyned together by a glew, which they make of the skins of ſuch Fiſhes as we call *Pearches*, laying thoſe skins in warm-water, and keeping them there till the Scales come off; which when they are freed from, they boyl them in a little water, and ſcum them well, often turning, beating and comminuting them with a ſmall ſtick, till they become a kind of pultis, which they pour out and let dry, and ſo ſet by for uſe; wetting them with a little water, when any thing is to be glew'd therewith, as you do other Glew. Beſides this Hunting-trade, driven by their *Men* only, the ſame imploy themſelves alſo in other practices, as in *Cookery* (which no Women there muſt meddle with,) in *Building of Boats*, (which they do out of Pine-boards, joyning them together with Wickers, without any Nails,) in *Carpentry*, and in making of *Sleds*, *Trunks*, *Cheſts* and *Baskets*, and various Utenſils, either of Wood or Bones, neceſſary in a Family. Theſe being the Imployments of Men only, the Womens task is, to make Cloaths, Shoes, Gloves, and the furniture and trappings for their *Rheen-Dear*; as alſo to Spin, which is to make a kind of thred, not of Flax or Hemp (which is unknown to them) but of the ſinews of the ſaid *Dear*, which they dry and beat, and ſo prepare it to ſerve them for Thred, uſed in ſowing their Cloaths, Boots, Shoes and Gloves; which thred is of the length of the Nerves, it is made of. Though at times they make alſo ſome Yarn of Sheeps-wool, for the weaving of Ribbonds and Garters; ſometimes alſo of white Hars-hair, for Hats and Sleeves. To their Women it belongs alſo to Weave, and to draw Wire; which latter is done by them, by ſuperinducing Tin upon the fineſt above-mentioned Thred made of ſinews; which they do by melting pieces of Tin of an Ell long, and then drawing it with their teeth through bigger or ſmaller holes of a Horn, and making the wire flat on one ſide by inſerting a ſmall bone into the hole, through which the Wire is to be drawn. And with this wire the Women embroider their Cloaths, as we do ours with Gold and Silver-wire. As for their *Fiſhing*, that is a work common to their Men and Women. What is ſubjoyn'd to theſe things, about their Paſtimes, Converſation and Marriages, as alſo of the Travel of their Women with Child, and the breeding of their Children, may be fitter to read in the Author himſelf, than here.

Tenthly, He ſpeaks of the Diſeaſes of the *Laplanders*; concerning which he obſerves, that they know of no burning Feavers, nor Plague, and live, many of them, to 80, 90, and ſome to above 100 years of age, remaining in that age vigorous and able to do their work, and to travel any whither; yet they are ſubject to weakneſs of their Eyes, becauſe they much live in ſmoak; as alſo to Pleuriſies, Inflammation of the Lungs, and Giddineſſes; and now and then to the ſmall Pox. Againſt all their inward Diſeaſes they uſe the root of a certain *Moſs*, they call *Jerth*, and in want of that, the ſtalk of *Angelica*, making a decoction thereof in the whey of *Rheen-Dear-Milk*. Finding any pain in their Limbs, they apply ſome ignited matter (as the *fungus* adhering to *Beech*-trees) to the place affected, to bliſter it, and thereby to draw out the ill humours, and ſo to allay the pain. Their wounds they cure with no other unguent but the Roſin of Trees. If the froſt do benum or mortifie any limb, they preſently run a red-hot iron into a *Rheen-Dear* Cheeſe, and with the oyl dropping thence they anoint the frozen part, with admirable ſucceſs. The ſame Cheeſe boiled in Milk cureth their Cough, and other diſtempers of the Lungs, the decoction being drunk hot; which is alſo good, it ſeems, for their ſtomacks, to preſerve them from being vitiated by the conſtant drinking of water. As to their Burials, they give with the deceaſed a Hatchet, and a Flint with a piece of Steel, deeming, that at the Reſurrection they will in that darkneſs need light to find the way, and an Inſtrument to cut down what may be in their way, eſpecially among thick Woods.

Eleventhly, He reckons up the Animals, Vegetables and Minerals of *Lapland*, after he hath taken notice, what they want of them. They have no Horſes, Aſſes, Oxen, Sheep, nor Goats of their own Country. The *Rheen-Dear* ſerves them inſtead of all theſe; which is a kind of a *Hart*, but of an Aſh-colour, and a more bulky Body, and bearing three Horns, and having feet reſembling thoſe of Oxen or Cows, which are Cloven, though the Animal do not ruminate. It is naturally wild, but taken and tamed by the Natives, who caſtrate them after a ſtrange manner. Their Milk is very fat, thick, and very nouriſhing. They caſt their Horns every year; which the Females of them do not before they be with young. The other wild Beaſts in *Lapland* are, *Bears*, *Elks*, *Harts*, *Wolves*, *Beavers*, *Foxes*, *Otters*, *Martons*, *Squirrels*, *Ermins* and *Hares*. Of *Birds*, there are bred in *Lapland* *Swans*, *Gees*, *Ducks*, *Houps*, *Snipes*, all ſorts of Water-fowl, and of Wood-fowl, the *Cock of the Wood*, the *Heath-cock*, and the *Lagopus*. Of *Fiſhes* that Country alſo abounds, ſuch as are *Salmons* (which are very excellent there, and of which our Author ſaith, there was once in one year exported 13000 Tuns;) *Pikes*, often of the bigneſs of a Mans length and above; *Carps*, often an Ell long; *Trouts*, *Barbles*, *Gudgeons*, &c. Of *Inſects* that Country breeds but few; there are no *Serpents*, nor *Fleas*, though there be *Gnats* and *Waſps*. Concerning *Vegetables*, they want *Apples*, *Pears*, *Cherries*, and the like. They want alſo *Oak*, *Haſel*, *Beech*, *Lime* and *Plain*-trees; but they are well ſtor'd with *Pines*, *Firr*, *Juniper*, *Birch*, *Willow*, *Aſpin*, *Alder*, *Cornelion*, *Service*, *Ribes*, *Black-berries*, *Bramble-berries*, &c. Their *Herbs* are, abundance of *Graſs*, *Angelica*, the great *Sorrel*, and *Calceolus Lapponicus*, or *Braſſica Rangiferorum* (peculiar to that Country) not eaten by any Animal there: Beſides, they have *Daucus*, and excellent *Moſſes*, of which latter one kind yields food to the *Rheen-Dear* in Winter, but is death to Foxes. As to *Minerals*, there was found in that Country a Silver-mine *A.*1635; the firſt Mine that ever was diſcovered there; and another *A.*1660. There are alſo Copper and Iron-Mines, more than one. It yields alſo *Cryſtals*, *Amethyſts*, *Topazes*, and *Pearls*; of which the *Cryſtals* are by this Author ſaid to ſurpaſs the *Bohemian* Diamonds in hardneſs, and are uſed by the Natives to ſtrike fire with, when they want Flints.

Laſtly, He concludes with the mention of the many Rivers, Lakes, and Hills of *Lapland*, noting, that there is a Lake of that bigneſs, which hath as many Iſles in it, as there are Days in the year, and that many of the Mountains, which divide *Lapland* from *Norway*, are ſo high, that they are perpetually cover'd with Snow.

II. MAny worthy Perſons having lately written excellently well to promote the welfare of *England*, and other his Majeſties Dominions (ſome in one kind of way, others by other Expedients,) as we named ſome in our laſt foregoing Tract, ſo here we muſt go on to name others. And thrice happy were theſe United Kingdoms, if *SPQB*, if the Wealthy and the Multitudes would, with joynt endeavours and perſevering Induſtry, as heartily purſue the beſt Inſtructions for the common good of their own Country, whilſt God is pleaſed to give us peace, health, and manifold opportunities for Univerſal proſperity. I ſhall only mention here two *Engliſh Books*, whoſe Frontiſpieces, as they have a neer reſemblance, yet,without interfering, or obnoxiouſneſs on either ſide,they proſecute the ſame good intentions for the publick good. The one, in a more general way;with lively and warmly preſſing encouragements; the other, in the plaineſt language condeſcending to direct the beſt manner of practice, always calculating the particular charge and conſiderable profit of all adventures in *Agriculture*, and ſuch Trades as he ſollicits; of which he very exactly and fully proves the *Fiſhery* to be the Foundation and ſupport of all Trades,Navigation and Commerce in *Holland*; and may be ſo, and much better to *England*, *Scotland* and *Ireland*, when we ſhall be as kind and wiſe for our ſelves, as they are for themſelves.

One of theſe Books hath for Frontiſpiece, *THE TRVE* ENGLISH *INTEREST*, or *An Account of the Chief National Improvements*; *in ſome Political Obſervations demonſtrating an Infallible Advance of this Nation to infinite Wealth and Greatneſs,Trade and Populacy,with Imployment and Preferment to all perſons :* By *Carew Reynel* Eſq;*in* 8°.1674.

Though theſe promiſes be very great, and to many may ſeem immodeſt in the Front; yet,if leſs than half the particulars,which the Author hath digeſted into 32 Heads or ſhort Chapters, in very few ſheets, were duly regarded and practiſed, we ſhould obtain enough for our purpoſes; *viz.* 1. *INDVSTRY* (*ch.*1.) in which alone, if we could draw an equal yoke with our next Neighbours,we could want nothing. 2. *VINEYARDS*, (*ch.*15.) the want of which was the diſgrace of *Gallia Tranſalpina intus ad Rhenum* in *Varro*'s time,as he ſaith,*lib.*1.*c.*8; and the recovery of which (as it hath been heretofore in *England* and *South-Wales*,) would now be for the credit of thoſe Countries. 3. *Fair ORCHARDS*, *of good and wholeſome Cider*, (*ch.* 15.) the beſt ſtomach-Wine; for which much is done in many parts of *England* and *Wales*, and it advanceth daily. 4. *MVLBERRY Groves for the Silk-trade*(*ch.*12.) King *James* in the *6th* year of his Reign in *England* A. 1608. near about the time when that Trade began in *France*, applyed all kinds of aſſiſtances and ſtrongeſt reaſons to invite *England* to ſet on the work: and Mr.*Evelyn* hath done admirably well for it in his *Sylva*,*ch.*9.2 *Edit*. And we hope, that what his Majeſty, now reigning,hath done for it in the moſt likely places of his Dominions,will ſhortly appear from *Virginia*. If they ſend hither the Raw Silk, we can find more hands at leiſure for the Manufactures. But to proceed; our Author adds 5*ly*,*All ſorts and varieties of good HVSBANDRY* (*ch.*9.) And we think there were never ſo many kinds known in *England*,as of late years. Then 6*ly* for *Trades*, he recommends *Fine LINNEN* (*ch.*11.) and *Fine PAPER*; depending on it (*ch.*17.) 7. *TAPISTRY*,and all kinds of curious Manufactures (*ch.*13.) Our Ladies ſhould look to this. *Spinſter* was of old,and is ſaid to be ſtill,a Title of honour in terms of Law. Now is the time, whilſt our Neighbours are embroyled in War,to invite Artificers, *&c.* from *Cambray*, *Ipre*, *Courtray*,*Aras*, *Bruſſels*, *Delft*, and other parts of the Low Countries. 8. The *Fine Drapery* is lately advanced in *Wiltſhire*, *Gloceſter-ſhire*, and other parts of *England*. He adds 9*ly* the

LATTON-Trade, which is proper for *Cornwal*, *Devon*, and other places, where the Materials are at hand. 10. The *SALT-trade* (*ch.*17.) which goes on with great gain to them that ſet up their Coppers about *Lemmington*, between *Hampſhire* and the Iſle of *Wight*; and in like manner it may proſper all about theſe three Kingdoms, wherever they can get Coppers, Fuel, and Sea-waters. But 11*ly* he chiefly prefers *The Fiſhery* (*ch.*14.) which indeed would in a manner do all, and we wiſh it heartily, but fear it will be at a ſtand, till *S P Q B* do unite their Authority, power and ſtrength to carry it on. 12. He requires more *NEW INVENTIONS*, and the *ADVANCEMENT of ARTS and SCIENCES* (*ch.*25. 30.) To theſe fair motions ſome do make report, that ſo many Ingenious Arts, Artifices, Sciences, Inſtruments of Art, Accommodations, Inventions and Diſcoveries are lately ſpread amongſt us, that they provoke Envy: And that in peruſing the Alphabetical Tables of the *Eight Volums* of theſe Tracts, under the Head *Books*, they have numbred 250 Treatiſes; ſome of them large Volums, and elaborate; all of them pretending to Uſeful knowledge or buſineſs; moſt of them in the Learned, or Forraign Languages. And their main Importance is extracted into as plain *Engliſh*, as I could learn, or as the nature of the ſubject could bear: Certainly ſo plain, that any one of ordinary capacity may ſoon and eaſily thence diſcern, whether the Book be for his occaſions. Many of theſe are exactly rendred into *Engliſh*; ſome of them by Gentlemen, who are themſelves excellent Authors when they pleaſe; and we hope, our Stationers will not be wanting to embrace more of the beſt, when they ſhall be offer'd for the publick.

So much for this Author: 'Tis above my ſphere, and beſides my Commiſſion, to paſs any Judgment, either to cenſure or to applaud thoſe Politicals, which relate to Mony *ch.*2. or to Forreſts, *ch.*19. or to the *Engliſh* Colonies *ch.* 31. or what ever affronts any Statutes now in force, *ch.*6.16.28, *&c.* Theſe belong to an higher cognizance, and may be determined by Counſels of State.

The other Book, above pointed at, is entitul'd ENGLANDS *IMPROVEMENT REVIVED*, in *Husbandry, and Trade, by Land and Sea*, &c. by *John Smith* Gent. in 4°. of which hereafter.

An *Advertiſement* about a New ſize of *Globes rectified*.

There is lately ſet forth a New ſize of Globes *about* 15 *Inches diameter, Celeſtial and Terreſtial. In the* former, *not only the Right Aſcenſions and Declinations of ſeveral Stars are rectified; but the Conſtellations are ſo fairly and curiouſly repreſented, that the Fixt Stars appear much more conſpicuous, than in any other extant: In the* latter *there is ſcarce any part of the Earth, wherein a conſiderable alteration hath not been made; ſo that* Aſia *and* America *are in a manner new, and much different from what hath been hiterto drawn upon a Globe: The Eaſtern part of* Aſia *rectified more than* 10 *degrees; and many places in* Europe, Africa *and* America *more than* 5 *degrees, many eminent* Towns *inſerted, that were wholly omitted in others: The Longitudes and Latitudes of moſt places being now corrected and adjuſted not only by late Diſcoveries, but alſo by Trigonometrical Calculation, and the more accurate Celeſtial Obſervations of modern Authors; the names of whom, together with a further account of the Reaſons of ſuch differences and alterations ſhall be more at large expreſſed in a Treatiſe deſigned for the Uſe of theſe* Globes *by* R. Morden *at the* Atlas *in* Cornhil, *and* William Berry *at the* Globe *between* York-houſe *and the* New Exchange *in the* Strand, London; *who are the two perſons that ſent in this Advertiſement.*

Errata *in Numb.*101. Pag.3.l.29.r.*are freſh*, p 4 l.3.r.*from China*, p.7.l.27.r.*Inſects* for *Plants.*
Errata *in this Numb.* Pag.25.l.8.r.*ſtraight*, *ſtrictum*. p.27.l.30.r.*notatu*.

London, Printed for *Jo.Martyn*, Printer to the *R.Society*, 1674.

Numb. 103.

PHILOSOPHICAL
TRANSACTIONS.

May 25. 1674.

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Some Obſervations and Experiments about Vitriol, *tending to find out the nature of that ſubſtance, and to give further light in the Inquiry after the Principles and Properties of other Minerals: Communicated by a Fellow of the* R. Society, *who maketh uſe of Chymiſtry chiefly as ſubſervient to Phyſiology.*

V*ITRIOL* is by the Spagyrical Tribe reputed one of the chief Pillars of Medicine and Alchimy; and is indeed endowed with many excellent and truly admirable properties; being employed by Nature in her moſt Curious Mineral operations. 'Tis it ſelf one of the moſt noble and uſeful productions, and therefore deſerves our eſpecial Conſideration. I do not pretend to render a Mechanical account of its generation, nor a hiſtory of all that may be performed by its mediation in Medicine or Chymiſtry; my deſign is only to furniſh Inquiſitive perſons with ſome Obſervations and Experiments, which will probably enable them more eaſily to inveſtigate the Nature of this *Protean* ſubſtance, as alſo afford ſome further light unto them in their Inquiry after the Principles and Properties of other Minerals. *Vitriol* is of ſeveral kinds, being, for colour, White, Yellow, Green, or Blew; uſually, of the two laſt mentioned: And is made *either* of Mineral Waters, boyled up to a convenient conſiſtence; then ſet to Chryſtallize: *Or* extracted by Common Water out of Earths impregnated therewith. 'Tis alſo afforded by many ſorts of Stones, commonly called *Pyrites* and *Marcaſites*, which expoſed ſome Months unto Aerial influences, are reſolved into powder, and the Saline part diſſolved in Rain or other Water; then boyled and ſet to ſhoot, yields ſtore of Vitriol, eſpecially with the addition of Copper or Iron. It is often aſſociated with Earth and Stones, wherein Mettals are contained; and with many natural recrements of Mettals, ſuch as *Miſy*, *Sory*, *Chalcitis*; from which 'tis uſually ſeparable by the common method with Water; ſometimes not to be extricated until the Mineral be firſt calcined or burnt. It is alſo frequently found pure and perfect in the Caverns of the Earth, being an Efloreſcence of ſeveral Minerals; and this is accounted by all Naturaliſts the beſt, both for Medicinal and Spagyrical uſes. *Laſtly*, It is copiouſly contained in common Mineral Sulphur, as I ſhall anon fully evince. Vitriol uſually accompanying moſt Mettals and Minerals, many do apprehend, it is alwaies one of their component principles, at leaſt, a neceſſary Cauſe of, or Agent in, their Production; which if meant of the Acidity or Saline part of Vitriol, ſeems highly probable; as I ſhall manifeſt at large in the enſuing diſcourſe. But firſt I think it expedient to examine, what are the conſtituent parts of Vitriol, whereby we ſhall be better enabled to judge of its nature and properties.

Vitriol conſiſts of Inſipid phlegme, Earth or Oker, ſome Mettal, Mineral Sulphur, an acid Salt or Spirit, together with ſome ſmall portion of the Volatil Aerial Salt.

That it contains *Water*, needs no great proof, ſince no Saline ſubſtance can cryſtallize without it; and diſtillation will convince any perſon, that it exceeds in quantity any of the other Principles.

The *Earth* or *Oker* may be thus ſeparated: Diſſolve Vitriol in fair water, immediately a yellow powder will ſeparate, and in a ſhort time ſubſide: The greater the quantity of water imployed, the more Oker precipitates: The weaker the *lixivium*, the leſs able to ſupport Bodies more ponderous than common water: And the lighter the Water (as if diſtilled rain-water, or phlegme of vinous Spirits,) the more Earthy parts ſubſide, upon the ſame Hydroſtatical principle I juſt now mentioned. I have above twenty times repeated this diſſolution, ſeconded by filtration and coagulation, and each time ſeparated ſome quantity of this Earth; and am perſwaded, had I long continued the operation, the ſucceſs would have been the ſame; only I obſerved the quantity ſeparated each time ſenſibly to diminiſh: And *Baſilius Valentinus* aſſures, that at length the Vitriol will let fall no more ſediment; and that then it is the ſubject of moſt noble operations by him particularized; which they who have leiſure, and confidence in his ſpecious promiſes, may do well to try. I have found a more eaſie and expedite way of effecting this ſeparation, which may be of great uſe to them who work on Vitriol, much abbreviate their labour, and conſiderably leſſen their expence.

Take a good quantity of the common, *Dantzick*, or *Hungarian*, Vitriol; having powdred it, put it into a ſlender Cucurbite, place it in Water, keep under it an equal conſtant fire three or four days: The Vitriol without additament will become fluid, as if diſſolved in water, and the Oker with moſt of the Metalline parts, with the groſs Sulphur, will ſubſide, and become a hard Cake at the bottom, the Vitriol being fluid above it, which in the cold again Cryſtallizeth; excepting a ſmall quantity of liquamen of the ſame nature with that we ſhall hereafter mention: This repeated once or twice, the Vitriol attains unto a high degree of purity, and is eaſily capable of many alterations, whereunto it was not ſubject be-

fore

fore this purification. This operation will not ſucceed in a dry digeſtion; I mean, Aſhes, Sand, Filings of Iron, Steel, open Fire, or even flame of Lamps, whether fed with Oil or Spirit of Wine. This Earth may alſo be obtained in a great proportion, though in another form, if after a long and intenſe Calcination the Vitriol is freed from its remaining Salt by frequent ablutions with warm Water: The far greateſt part of this dulcified Colcothar is inſipid Earth with ſome ſmall proportion of Mettal. The ſame may be precipitated by Salt of Tartar, or any other Alcalies, or filings of *Zink*, or other immature Minerals, out of a ſolution of Vitriol in Common water: It being alſo ſeparated from Metalline and Saline parts, by a method I ſhall hereafter mention, there remains a great quantity of an inſipid ſubſtance nearly reſembling burnt Allom: Beſides, whereas *Salt, Nitre, &c.* require in diſtillation a larg quantity of Earthy ſubſtance to disjoyn the Saline parts, and prevent fuſion; Vitriol and Allom need it not; an unqueſtionable proof, that Earthy parts abound therein.

That Vitriol contains *Sulphur*, is evinced by the Sulphureous ſmell it emits in diſtillation, eſpecially if urged with a ſtrong fire from the beginning; and the Spirit thus drawn being rectified, the Liquor, which firſt ariſes, hath a highly Sulphureous ſmell, as hath alſo that we ſhall hereafter mention, diſtilled from Vitriol deprived of its Metallick parts. The *Colcothar* dulcified, or Metallick parts precipitated by an Alcali, or immature Mineral, ſublimed with Sal Armoniack, an inflammable Sulphur may be many ways ſeparated, both from the ſublimate and *Caput mortuum*. The Common Oil of Vitriol digeſted on Antimony, then diſtilled, yields a much greater quantity of Sulphur, than would have been produced, had any other acid liquor been imployed; and the ſame Oil of Vitriol digeſted with Spirit of Wine, and diſtilled, yields an Oil, and at the latter end ſtore of Sulphureous inflammable flowers.

As for the *Acid* Saline Principle, I ſuppoſe no perſon who hath taſted the Spirit of Vitriol, and that abuſively called, its Oil, will queſtion its abounding in that ſubject.

Some add unto the Principles, we have enumerated, the

Salt to be ſeparated from the *Colcothar* after diſtillation; which I omit, Experience having learned me, that it is of the ſame nature with the former, only ſomewhat more fixed; and if the Spirit be cohobated from the *Caput mortuum*, it is with the reſt volatilized, nothing remaining beſides Mettal and inſipid Earth.

The *Saline* Principle being that whereon I intend chiefly to inſiſt, I ſhall enquire whence it derives its Original? what ſubject it doth moſt reſemble? or with what 'tis moſt nearly allied? In order to the reſolution of theſe Enquiries, and the confirmation of certain Propoſitions, hereafter to be mentioned, I ſhall premiſe ſome Experiments, made many years ago, which perhaps may give no leſs ſatisfaction unto many of our Experimental Philoſophers, than they afforded me, when I firſt made mine.

I took four or five Gallons of the Vitriolate water, which was conveyed, by artificial Channels at *Deptford*, from the beds of *Pyrites* or *Marcaſites* into the great Ciſtern. I diſtilled therefrom in glaſs Veſſels two thirds of inſipid water; letting the Glaſſes cool, the water let fall a Vitriol of a lovely dilute Colour, (whether green or blewiſh I do not remember,) together with a great quantity of that yellow Sediment which we formerly called *Oker*: Then evaporating a third part of the remaining liquor, I received more Vitriol of a paler colour than the former, and *Oker* as before, though leſs: The fifth time this operation was repeated, inſtead of Vitriol it afforded a yellow, and ever after a white, Salt, which did differ exceedingly from Vitriol, not only in colour, but alſo taſte; being fiery and pungent; did partake little of that abominable rough aſtringent ſmack which is peculiar to Vitriol. It was alſo unctuous, like Salt of *Tartar*; made the hands ſoft and ſupple, cleanſing like a *Sapo*; whereas Common Vitriol renders them rough, and harſh: Being diſſolved in water, it appeared to the very Eye very fatty and oleaginous.

Among many other appearances ſufficiently remarkable, in this laſt Liquor and Salt, I ſhall only mention theſe few;

1. *Obſ.* From five pounds and a half of *Lixivium*, I received four pounds of this fiery white Salt, beſides half a

pound of *liquamen*, which remained fluid, and would not coagulate. I do the rather mention this; for that is one of the moſt eminent Inſtances, I ever met withal, of ſo great a quantity of Salt kept fluid in the cold by ſo ſmall a quantity of water.

2. The remaining *liquamen* was very fiery, acidly pungent, and extreamly ponderous; no whit inferiour, in my opinion, in any of theſe reſpects, to common Oil of Vitriol; it ſeeming to me ſtrange, and unuſual, that ſo ſtrong a liquor ſhould be obtained without any conſiderable degree of fire.

3. This *liquamen* being expoſed unto the Air, ſoon *attracted* (if our Criticks will permit me to uſe ſuch an expreſſion,) double its quantity of moiſture. I cannot recollect, that I did ever obſerve any fluid body, which approached near unto it for this property; though I am not ignorant, that all corroſive Saline liquors will borrow conſiderably from their neighbouring Element. And I remember, that divers eminent Chymiſts have delivered ſeveral preparations of Vitriol, which derive moiſture from the Moon more or leſs, according unto her ſeveral *Phaſes*; which I am perſwaded is a meer dream, having ſeen little hitherto that ſhould perſwade me, any of the Planets do influence otherwiſe than by heat and light. And I always obſerved this *liquamen* to acquire more or leſs moiſture, according to the Conſtitution of the Seaſon, riſing ſenſibly in moiſt weather, and little in dry, without any reſpect unto the Moon or other Planets; which I can the more poſitively determine, having for ſeveral Months made accurate obſervations with conveniently ſhaped Glaſſes. But to return from whence we digreſſed;

The white Salt laſt mentioned was diſtilled in a Sand-furnace, and the far greater part came over in the form of a Spirit highly acid, eſpecially that which came laſt in ſmall drops. This liquor rectified in a very tall body, immediately upon the approach of the ſmalleſt degree of heat a volatile Sulphureous Spirit did ariſe, clear as Rock-water almoſt, nay I think altogether inſipid; yet the ſmell ſo ſubtile and penetrating, that 'twas inſupportable: And ſuch it continued many years, not letting fall any ſediment, and thereby looſing its ſtrength, as doth the volatile Spirit made out of

Common Vitriol. The Spirit which remained after the ſeparation of the more volatil, was in all reſpects like that of *London* Vitriol; only ſeemed more gratefully acid, and might, like it, be ſeparated into Spirit, and Oil, corruptly ſo ſtiled.

Vitriol freed, as is before declared, from its Earthy and Metallick parts, by *Zink*, or other imperfect Minerals, is much of the ſame nature, and yields its Spirit in Sand, as this we have now mentioned: Is alſo White, and more unctuous; hath a grain more like Nitre than Vitriol; as hath alſo the *Goſlar* Vitriol, which is White, and comparatively unctuous, becauſe it hath little Mettal, and leſs Mineral-Sulphur than the Common; whoſe Metalline part detains the Saline, and will not diſmiſs it until long urged by a very intenſe degree of heat. What remained in the Retort, after this diſtillation, was not red or purple, like the *Caput mortuum* of Common Vitriol, but white, light, and ſpongious, like burnt Allom, and altogether as inſipid; although, after it was ſome time expoſed unto the Air, it received many ſtrange impreſſions and alterations; which, though very remarkable, I omit, as not anſwering my preſent deſign, which is to enquire, whence the Saline principle in Vitriol proceeds, and how it comes to be ſo compounded? But firſt, I cannot but take notice of the great affinity that is between *Vitriol*, *Allom*, and *Mineral Sulphur*; the Saline Principle, which is in each of them by far the chief, both in quantity and energy, having one nature and the ſame properties; although in the laſt clog'd with a ſmall portion of Sulphur. For notwithſtanding what is commonly received, I ſhall clearly prove, that the body of Common Sulphur is a Vitriol Salt, the very ſame with that, which is ſeparable from Common Vitriol; and that the Sulphureous parts are not only leſs copious, but inconſiderable for bulk, compared with the Saline; which are ſincere Vitriol, not differing from the Common; only that doth not ſo much abound in Metallick and Earthy particles.

So far the Author for this time, having been unexpectedly interrupted to proceed in this deſign, which he hath promiſed to finiſh for the next opportunity.

Some Inquiries and Suggeſtions concerning Salt *for domeſtique Uſes; and concerning* Sheep, *to preſerve them, and to improve the race of Sheep for hardineſs, and for the fineſt Drapery: In a Letter from Doctor* John Beal *to the Publiſher.*

1. SALT gives the ſavour and guſt to all our diet; and would be the beſt and ſureſt prevention againſt the Rot of Sheep, if it could be had at eaſie rates upon the Downs; for which *England* is generally moſt concern'd: For, Sheep do ſupport our great Staple-trade, as is implied in the Proverb, *That London-bridg hath Wool for the Foundation, and that our Senators in Parliament do ſit on Wool-ſacks.* Therefore I here annex and intermingle the Conſideration of *Salt* and *Sheep*, as moſt neceſſary commodities, and not out of the road of your Uſeful Philoſophy; nor by you omitted in your *Ph. Tranſactions.* Againſt the Rot in Sheep *Spaniſh Salt* is recommended *numb.* 100: And the means to get Salt is deſcribed or ſuggeſted *numb.* 51, 53, 54, 66, 102.

2. From the laſt of which I will begin to ſollicite theſe further Inquiries: At what places about *Lemington* in *Hampſhire* Salt is made? What quantity is made there? Whether any Salt be made in the *Iſle of Wight*, or in the Iſles of *Jerſey* or *Guernſey*, or on any Iſles or Coaſts belonging to *England, Scotland,* or *Ireland?* And what is the peculiar accommodation in *Lemington*, which occurs not on other coaſts? What Kind of Salt, white or bay, *&c?* And, if it might be obtain'd from a truſty friend, to know, what is the gain by each Copper at *Lemington*; the proportion of the Copper; how many workmen for one or more Coppers; what their wages, and what other charges? To the purpoſe, that where the wages or other charges are leſs, and the accommodation not wanting, the ſupply for the neighbourhood, or as the Seas and Rivers may convey the Salt, may be encouraged. Note, that the brine at *Nantwich*, contains a third, or fourth, or, when leaſt, a ſixth part of Salt.

3. Mr. *Winthrop* by Letter told you, that he had the way of making good Salt in *New-England* in great abundance and at eaſie rates. They complain, that great wages are required there;

which does much retard their building of Ships and their Iron-works: which would otherwiſe do them great ſervice, and do a neceſſary Kindneſs to this Kingdom at preſent, if applied to ſave our Timber, which begins to be ſcarce. And Salt is requiſite for their great advantages by *Fiſhery*; if they have learnt to *cure their Cod and Sturgeon*, of which they have abundance on their Coaſts and Iſles; and thy have the neareſt approach to ſecure the *Engliſh* intereſt on *New-found-land*, and for the Fiſhery on the *Bank.* Under one you may inquire, what accommodations they have, or what helps for Salt about *New-York*, or other places in that Continent, or in any Iſles of the *Engliſh* Colonies. If a ſufficient Sun-ſhine and Induſtry be not wanting in *Ireland,* I cannot gueſs what ſhould hinder them to have abundance of Salt for themſelves, and their Fiſhery, and for others; ſince they cannot want Workmen, and their wages, (as I am inform'd) not great, if compar'd with the uſual demands in *South-England.*

4. In *Varro's* days it was the reproach of our *Tranſ-Alpines* (who dwelt much farther towards the South than we do) that on the *Rhine* there were then neither Vines, nor Olives, nor Apples, nor Sea-ſalt, nor Foſſil Salt; but were driven to the poor ſhift of uſing burnt wood for their Salt: *Ubi nec Vitis, nec Olea, nec Poma naſcerentur*; *ubi Salem nec foſſilem nec maritimum haberent, ſed ex quibuſdam lignis combuſtis, carbonibus ſalſis pro eo uterentur. Varro de re ruſt. l.* 1. *c.*7. The world is, as to thoſe things, much amended (ſince thoſe dayes) on this ſide the *Alpes*: And the *Engliſh* may yet be minded to proceed, as far as they can, to remove the reproach; at leaſt for Fruit, Wine, and Salt. *Cato c.*88. teaches diligently, How to make vulgar Salt (*popularem Salem*) purely white. *Columella l.* 12. *c.*53. ſhews, How to order our Bacon, and our Salt (*cocto Sale, nec nimiùm minuto, ſed ſuſpenſâ molâ infracto, diligenter ſalito,*) for our delicate Gammons, *&c*: And there inſtructs, How to boil Salt, and how to ſeaſon the ſeveral parts of Bacon. And *l.*6 *c.*1. for application to ſore Eyes (a curious point,) he prefers *Salem Montanum, Hiſpanum, vel Ammoniacum, vel etiam Cappadocum, minutè tritum, & immiſtum melli.* All our good houſewives do find a great difference between our common Bay-Salt, and the ſeveral other Salts, which are in ordinary uſe

amongſt us. We find ſome White Salt very faint; and the price imports a difference between *Spaniſh*, *French* and *Portugal* Salt.

5. The Illuſtrious *Palladius*, who wrote about the Year 350, and had his ample Manors or Territories in *Italy*, *Naples* and *Sardinia*, and thereby had great experience in *Sheep*, ſeems to give *ſure rules, How to preſerve the Flocks ſound*; *Novemb. tit.* 13.*Sect.*2. Amongſt his Adviſo's he ſaith; *Salis tamen crebra conſperſio, vel paſcuis miſta, vel canalibus frequenter oblata, debet pecoris levare faſtidium.* All theſe three, *Palladius*, and *Varro*, and *Columella*, do give infallible inſtructions for the preſervation of our Flocks; but the Rules cannot be obſerved by thoſe that have the greateſt Flocks: *To change Paſtures often*; *to be ſupplied in rainy ſeaſons with dry fodder*; *to lick ſalted troughs*; *to have ſome turns in Salt-marſhes*: The words of *Palladius l. cit.* are; *Paſcua ovillo generi utilia ſunt, quæ vel in novalibus, vel in pratis ſiccioribus excitantur*; *paluſtria verò noxia ſunt.* And *Gabr. Prat.* from his own and his anceſtors experience of 80 years, bids us take heed of the pregnant verdure, when much rain falls in the vernal months of *April* and *May*: And all Sheep-maſters are afraid of rainy Autumns. But whence ſhall the relief be had? The charge will be heavy, if the ſame fodder be provided for every year, and the deſtroying years do ſurprize us. I hear, that about *Salisbury* ſome do plough up a few acres, and ſow a kind of pulſe, which they there call *Tilth.* And now we have in *England* ſo many kinds of *French* ſeeds, and *French* graſs, that one kind or other is like to proſper in moſt places; and fodder well ordered in ſtacks will hold out for many years; perhaps for Sheep the older the better. And hereabout they hold ſuch friendly correſpondence, that in Autumn I ſee the Shepheards drive the flocks out of *Somerſetſhire* into *Dorſetſhire*, and thoſe of *Dorſetſhire* into *Somerſetſhire*, for the benefit on both ſides by change of Soil. *Note*, that crude *Antimony* cures Sheep and other Cattel, and fattens them alſo. I omit many particulars commonly known, and obſerv'd by careful Shepheards, as in ſhowers and ſoon after a ſhower, to drive the flocks gently, that they may beat off the dew with their feet, before they be ſuffered to feed on the wet graſs; eſpecially in cold mornings, when

dewy cob-webs lye upon the Paſtures; and to let the Sheep blood under the eye, as ſoon as they can diſcern them rank of blood. I muſt refer to Mr. *John Smiths Englands Improvement, lib.* 5. *p.* 170, 171; hoping that he will beſtow a few ſheets more to direct punctually the beſt way of Ordering Sheep, and the moſt effectual remedies againſt the ſeveral kinds of Rots, and their other diſeaſes, as a matter of no ſmall concernment to *England*, and in which he ſeems to have much experience.

6. To return for more Salt, and to know the ſhifts that are made, and lately were made for it in *England*. At *Wire-water* in *Lancaſhire* Salt is gathered out of heaps of ſand along the Sea-ſide in many places: Upon which Sand (ſaith *Speed*) the people powre water, until it gets a Saltiſh humor, which they afterwards boil with Turfs, till it become white Salt. *Cambden in Britann. fol. p.* 753. deſcribes it thus; *In ora hac maritima multis in locis ſabuli cumulos videas, quibus aquam ſubinde infundunt, donec ſalſuginem contraxerit, quam poſtea ſubditis glebis in candidum ſalem excoquunt.* And *Speed* ſaith; There are certain ſtones lying in the river *Were* at *Butterbec* near *Durham*, from whoſe ſides at the ebb and low water in Summer iſſues a certain Salt reddiſh water, which with the Sun waxeth white, and growing into a thick ſubſtance becoms a neceſſary Salt for the by-dwellers. *Cambden p.* 744. deſcribes it thus; *Inde Vedra decurrit, crebrò eminentibus ſaxis interpolatus, quibus ſi aqua infundatur, parumque miſceatur, ſalſam imbuit qualitatem.* Sir, you took notice of two or three ſaline ſprings in this neighbourhood of *Somerſetſhire*: One examin'd by Dr. *Highmore*, in your *Numb.* 56. *p.* 1130; another, *numb.* 57. *p.* 1162. And doubtleſs there are many more ſuch in *England*, if well obſerv'd: And though the proportion of Salt be ſmall, yet they may ſerve for ſome domeſtick uſes. The water in Summer time, when the brine is ſtrongeſt, being caſt in any place where it may be ſoon dried by the Sun, and where we would have pigeons reſort, does pleaſe them well. So will any refuſe brine, being boil'd up to a conſiſtence. But I know not, whether ſuch brine, taken from powder'd fleſh, will be kind for Sheep. *Poſſibly ſuch ſaline ſprings may indear foſſil Salt for future Induſtry.* And *numb.* 56. *p.* 1135. you recite from worthy Mr. *Evelyn* a good hint, to encourage ſome attempts for the *multiplying of Salt, in Sylva ſecund. Edit.*

*c.*3.*p.*26. *Sect.* 17. Sir *Hugh Plat* hath ſaid and collected enough of the vertues and uſes of Salt (and how it may be obtain'd,) for the fertilizing of Land, in his *Jewel-houſe.ch.*104.

7. Now to improve the *Race* of our *Sheep* for hardineſs, or for largneſs of the ſize, and abundance of Wool; we hear, that many wealthy Sheep-maſters on the Downs do offer very high rates for the largeſt Sheep, Rams eſpecially, that they can procure; And ſometimes they buy from forrain parts very large and luſty Rams; and find the benefit by the largeneſs of the deſcending race. And, ſince in ſeveral parts of *England* they ſeriouſly ſet on for the fineſt *Drapery*, 'tis to be wiſh'd, that our Merchants would bring us from thoſe parts of *Spain*, *Italy*, and *Greece* (which boaſt of the fineſt Wool,) both Rams and Ewes that bear the fineſt Wool, that we may try them at *Lembſtersore* in *Herefordſhire*, where they are skil'd, and generally practiſed in ordering ſuch delicate and tender Sheep; and to try them in other parts, where they pretend to the fineſt Wool in *England*. Our Merchants ſay much, and require good pay for the *Spaniſh* Wool; ſome for the Wool of *Segovia*. Of old the Sheep of *Tarentum* had in *Italy* the higheſt eſteem. Theſe *Tarentin* Sheep were brought into *Italy* from *Greece*, and were ſo tender and did require ſuch curious and coſtly attendance in *Varro*'s days, being all cover'd with leather pelts (*pellibus integuntur*) to guard them from heat or cold, and to preſerve their purplefleeces from all pollution; *Varro l.*2 *c.* 2; and after, in *Columella*'s time, required ſuch exact skill to preſerve them, *Colum. l.* 7. *c.*2. that I know how to recommend them for our *Engliſh* climat, and our ordinary Shepheards. *Pallad.* ſaith *l.cit. Græcas oves, ſicut Aſianas, vel Tarentinas, moris eſt potiùs ſtabulo nutrire quàm campo.* I muſt refer to better advice for ſuch a race as is likely to live amongſt us: And then, if Gentlemen would make the trial to amend the race of Sheep, (as they have often attempted to amend our race of Horſes by the beſt of *Barbary*, and as with more hope the Gentry in *Ireland* may aſſay to mend their mettalſome Hobbies with *Spaniſh* Genets, or Barbs from *Tangier*;) under one, by the ſame or like diligence, and by the ſame adventure; they may chance to oblige their Country both ways, both with Sheep bearing finer Wool, and with better Horſe than the *Iriſh* Hobbies; I dare not ſay, than the right *Britiſh*.

For I was told by a great Maſter of Horſes, who had many years experience of Stallion Barbs, the beſt he could buy; that the Baſtard Barbs, deſcending from the beſt *Engliſh* Mares he could obtain, were conſtantly better ſhaped, and better for the Sadle, and other ſtronger ſervice, than their Syres. But I turn'd here aſide to name *Ireland*, becauſe the Rot of Sheep is not ſo ordinary in *Ireland* as in *England*, and they are nearer *Spain* and *Tangier* than we are: And they are highly to be commended for their late Induſtry, both in the Linnen and Woollen manufactures; which may nobly provoke our Emulation. And whilſt *England* and *Ireland* ſtrive to excell each other in good things, we draw cloſer to a perfect union, and to give ſtrength and aſſiſtance to each other mutually. Sir, you having been long accuſtom'd to bear the burthen of uſeful Inquiries, and to promote the common good, you'l pardon this freedom in, *&c.*

An Accompt of ſome Books.

I. *About the Excellency and Grounds of the* MECHANICAL HYPOTHESIS, *ſome Conſiderations occaſionally propos'd to a Friend by* R.B.E. *Fellow of the R. Society.* London, 1674. *in* 4°.

This Diſcourſe is annexed to another, entituled, *The Excellency of* THEOLOGY, *compar'd with* NATURAL PHILOSOPHY; which though it be not of a direct tendency to the deſign of theſe Tracts, yet doth it occaſionally mention divers things, fit to be taken notice of by a Student of Natural Philoſophy; ſuch as are the uſeful hints and directions, *to* guide him in the making Experiments skilfully and warily (*p.* 118, 119;) *to* encourage him to the improvement of Natural Philoſophy, now that the *Mechanical Hypotheſis* is ſufficiently ſetled, and the right Methods of Inquiring are found out (*p.* 171;) *to* inſtruct him, how injurious *Syſtematical* Writers are to the true ſearch of Nature (*p.* 193;) and what care is to be had of eſtabliſhing *Philoſophical Hypotheſes* (*p.* 208;) as alſo, how much remains yet to be diſcover'd of Nature (*p.* 174, 176, 178;) and how Philoſophy hath recoiled by the *Ariſtotelians* laying aſide Mathematicks, and diſputing of Generals (*p.* 204;) and by whom the Experimental and Mathematical way of philoſophizing hath been reſtored and brought into eſteem (*p.*205, 206:) Among which particulars there occur alſo ſeveral notable Conſiderations about the Nature of Body and Senſation (*p.*144, 145.153;) and divers Inſtances of Philoſophy improved (*p.*209,210,211;) not only in reference to the underſtanding of the ſenſible Qualities of things, and their Cauſes (*p.*211,212;) but alſo as to Practical Inventions and Inſtruments (*p.*213,) *&c.*

But to paſs to that Diſſertation, which is more within our Sphere, *viz.* Concerning the *Excellency* and *Grounds* of the *Mechanical Hypotheſis*; the Noble Author thereof maketh it his buſineſs to evince, that the other *Hypotheſes*, entertain'd by the ſeveral Sects of Philoſophers, are ſo far from overthrowing the *Mechanical*, that they will either be foiled by it, or found reconcileable to it. In the doing whereof, having firſt declared his meaning about the ſubject diſcours'd of, (*viz.* the *Mechanical Philoſophy*,) he ſuccinctly and plainly delivers the particulars that recommend it.

1. Of the Principles of things *Corporeal* (for ſuch only he here treats of;) none can be more *few* without being inſufficient, or more *primary*, than *Matter* and *Motion.*

2. The natural and genuine effect of variouſly determin'd *Motion* in portions of *Matter*, is, to divide it into parts of differing *ſizes*, and *ſhapes*, and to put them into *different Motions*; the conſequences of which are, *poſture*, *order*, *ſcituation*, and peculiar *textures.*

3. The parts of *Matter* endow'd with theſe *Catholick affections* are by various aſſociations reduced to Natural Bodies of ſeveral kinds, according to the plenty of the Matter,and the various Compoſitions and Decompoſitions of the Principles; which all ſuppoſe the common matter they diverſify: And theſe ſeveral kinds of Bodies, by vertue of their Motion,Reſt, and other Mechanical affections, which fit them to act and to ſuffer, become endow'd with ſeveral kinds of Qualities, and with thoſe, that work upon the peculiarly fram'd Organs of Senſe,whoſe perceptions by the Animadverſive faculty of the Soul are Senſations.

4. Theſe Principles, *Matter*, *Motion*, *Reſt*, *Bigneſs*, *Shape*, *Poſture*, *Order*, *Texture*, being ſo *ſimple*, *clear*, and *comprehenſive*, are by our Author ſhown to be applicable to all the Real *Phænomena*

nomena of Nature, which ſeem not explicable by any other not conſiſtent with theſe. For, *ſaith he*, if recourſe be had to an Immaterial Principle, it may be ſuch an one, as is not intelligible; and however it will not enable us to explain the *Phænomena*, becauſe its *manner* and *way* of working upon things Material would probably be more difficult to be *phyſically* made out, than a Mechanical account of ſuch Effects. And as to an Immaterial *created* Agent, we cannot conceive, how it ſhould produce changes in a body without the help of Mechanical principles, eſpecially *Local motion*; and accordingly we find not, that the Reaſonable Soul in Man is able to produce what changes it pleaſeth in the Body, but is confin'd to ſuch as it may produce by determining or guiding the Motions of the Spirits, and other parts of the Body, ſubſervient to voluntary Motion.

5. And if the Active principles reſorted to, be not Immaterial, but Corporeal, they muſt either in effect be the ſame with thoſe lately mentioned; or, becauſe of the great Univerſality and Simplicity of the ſame, the New ones propos'd muſt be leſs general than *they*, and conſequently capable of being ſubordinated or reduced to thoſe aſſerted by our Author, which by various Compoſitions may afford matter to ſeveral *Hypotheſes*, and by ſeveral Conditions afford minute Concretions exceedingly numerous and durable, and conſequently fit to become the Elementary Ingredients of more compounded Bodies, being in moſt Trials Similar, and as it were the Radical parts, which may after ſeveral manners be diverſified, as in a Language the Themes are by *Prepoſitions*, *Terminations*, &c. So that the fear, that ſo much of a *New* Phyſical Hypotheſis, as is *true*, will overthrow or make uſeleſs the *Mechanical* Principles, is, as if one ſhould fear, there will be a Language propos'd, that is diſcordant from, or not reducible to, the Letters of the Alphabet.

" II. IN my laſt, (*Numb.* 102.) I promiſed a fuller accompt of
" Mr. *John Smiths ENGLANDS IMPROVEMENT*
" *revived*, in a Treatiſe of Husbandry and Trade, by Land and
" Sea; plainly diſcovering the ſeveral ways of improving theſe-
" veral ſorts of waſte and barren grounds, and of enriching all
" Earths, with the natural quality of all Lands; and the ſeveral

“Seeds and Plants, which naturally thrive therein, obſerv'd, &c.
“ Together with the manner of planting all ſorts of Timber-
“ trees and Under-woods. Experienced in 30 years practiſe, and
“ digeſted into ſix Books.

The Books are brief, all contain'd in a thin 4°; Addreſſed to the Lord Viſcount *Brouncker*, Preſident of the *R. Society*: Recommended for the Uſefulneſs and publick Benefit by the Worthy *John Evelyn* and *Samuel Woodford* Eſquires, both Fellows of the ſame Society, with ample and hearty Teſtimonials. The moſt worthy and moſt generouſly obliging are leaſt of all prone to be envious, but do rejoyce in every hand that brings the beſt aſſiſtance to promote the publick Weal:

> *Livor, iners vitium, mores non exit in altos,*
> *Utque latens imâ vipera ſerpit humo.* } Ovid.

I beg leave to add this free Note: If the Waſts and Abuſes of Forreſts herein particularized ſhall for the future be avoided; and the Waſts, Commons, and bald Hills be henceforth cultivated, as is hereby directed; and if our Nobility and wealthy Gentry ſhall follow the Royal and moſt Illuſtrious Examples, and take heed of chuſing or truſting ſuch ignorant and lazy Stewards and Bailives, as *Columella* rejects; we may hope, in a ſhort time to ſee *England* as much excel it ſelf in Rural Improvements, as our *Metropolis* is advanc'd from her late confuſion and aſhes by her preſent and ſpeedy Reſtauration. And to confirm this *Item*, we may already ſee, how largely our Rural affairs have flouriſh'd, ſince Mr. *Evelyn* publiſh'd his excellent Volum of *Sylva* and *Pomona*, to direct and encourage the Plantation of Forreſts, Woods, Groves, and the richeſt Cider-Orchards: Which *Volum* had not its due fulneſs, nor compleat Emendations, till *A.* 1670. in a ſecond Impreſſion.

He muſt needs be a lazy and ignorant Steward, that cannot provide a Nurſery of *Mulberry-trees*; nor can yet underſtand, that from this diligence the greateſt part of wealth of *France* is now (and but lately) maintain'd. If God ſhall be pleas'd to bleſs the fruits of the Earth, we have fair and viſible grounds to hope, that good and wholeſome Cider (better than was known to our Forefathers,) will the next following year be, at eaſy rates, to be had on all the roads of *England* from the remoteſt Weſtern parts to *London*, and an hundred miles deep towards the North from our SouthernCoaſts: And the richerCounties in theEaſt will diſdain to come behind; nor can fail, if they take equal care that their Cider be good and wholeſom. And this will be great ſatisfaction to all Travellers, who by experience do find the ſalubrity of Cider, or do diſguſt the many changes and miſchances of Beer, by ill brewing, or ſooty malt, dryed on wood-fires, *&c.* And if Gentlemen, when they return to forrain parts, would be pleas'd to bring over ſuch as have skill in planting Vineyards, ordering the whole Vintage, and making Wine; we might reaſonably hope to ſee as great advancement of *Vineyards* within five or ſix years, as we do of *Orchards* this day:

Sed tamen eſt Artis triſtiſſima Janua noſtræ,
Et labor eſt unus, tempora prima pati.
Dimidium facti qui bene cæpit habet.

Janus being asked, why Frankincenſe and Wine ſhould be offer'd to him firſt before all other Gods?

Omnia principiis, inquit, ineſſe ſolent. Ovid. Faſt. l. 1.

Good beginnings run a great way: And juſtly we give the firſt honor to him that leads the way, or opens the Portal, by a fair Example, which ſeldom fails of a good effect among the Ingenuous.

But to paſs to the Book it ſelf, the *Frontiſpice* to it is ſo copious and expreſſive, that I may be the briefer in my Extract.

In the *firſt Book*; Trade ſupported by Navigation. His Majeſties Soverainty in the *Britiſh* ſeas juſtified by the moſt ancient and all modern Records, and the practice of other Nations. Forreſt and Timber the ſtrength of the Crown, and Kingdoms. Hammers and Furnaces for Iron, great waſters for Wood and Timber; and horrible Waſts committed by Keepers, Forreſters, and others.

In the *ſecond Book*; Directions to make a ſerviceable and profitable Fence; and the charges. Some ground unkind for Trees. The Original of Plants. The choice of Seed and Plants.

In the *third B.* Directions to plant one Acre of land ſeveral ways, and at ſeveral diſtances. The number of ſeed and plants given to plant a 1000 Acres of Land at ſeveral diſtances. The beſt ſeaſon of the Year, and the manner of plowing ground to ſow ſeeds, or ſet plants. Several obſervations for the choice and ordering of ground for the diverſity of Seed; for tranſplanting Trees, Underwoods; for tranſplanting Trees of great bulk and growth; for dreſſing and pruning Trees. The growth and age of Timber-trees, almoſt incredible.

In the *fourth B.* The profit of planting a 1000 acres of land with ſeed, or ſets for Timber-trees and Under-woods. An account given of 29548000 acres of land in *England*, beſides that which is allow'd for the High-ways. Loſs of ground by reaſon of the Fence. The charges of plowing and planting ſeeds and ſets for Timber-trees and Underwoods. The charges of delving lands for the ſame Uſes.

In the *fifth B.* Of planting pleaſant Walks with Timber-trees and Groves. The charges and profits of keeping a 1000 tame Conies. Of Sheep. Several directions to make an Aviary; alſo a Fiſh pond. Of Pigeons. The choice of Cowes for a dairy. A view of rural amænities, *p.* 177. to *p.* 183. Again a rural proſpect of a well order'd village, *p.* 190 to 193. Directions to plant Herbs, *p.* 185. and Hops, 188. An Alphabet of Herbs for a Kitchin-garden, and vulgar medicines from Vegetables for Country-farmers.

The *ſixth B. Anno* 1633 he was ſent by the Earl of *Pembrock*; for the diſcovery of the Iſle of *Shetland*; To obſerve the manner of Trading; the profits and cuſtoms thereof; the ſetling of a Staple; the building of Store-houſes; the viewing of ground on ſhore, for landing and drying of Nets. Of the ordering and drying of Fiſh. The manner of the *Hollanders* Fiſhing for Herring with Buſſes; and with other veſſels for Ling and Cod. Of all which he here publiſhes his Journal, beginning *April* 27. 1633. And here he gives a particular accompt of the chief Iſlands about *Scotland* (in all, above 300, ſaith *Speed*, and the Author takes notice of more Iſlets than can eaſily be numbred.) Of the *Hamburgers* fiſhing on other Iſlands there. What Fiſh the Inhabitants do catch, and how. The dangerous Rocks, and violent winds. That **Saltpans may be ſet up in Shetland, and good Salt made to ſerve all the Fiſhing Fleet** *p.* 255. The *Scots* in *Shetland* were provided of Hooks and Lines, for the taking of Ling and Cod; Nets, for the taking of Herring; ſtrong beer, biskets, wheaten meal, ſalt, peaſe, fruits of all ſorts, ſtrong water, Monmouth Caps, and many other particulars, *p.* 256. The Inhabitants of the Iſle of *Ounſt* uſually have a Bark that they trade with to *Norway*; where they may buy timber for houſes, ready framed, deal-boards, tarr, ſhips, barks, and boats of all ſorts. In one of their ſmall Fiſhing-boats, rowing with two men, ſometimes with four, they do uſually bring to ſhore, every morning that they go to Sea, 50 or 60 Ling and Cod: And they take many barrels of Herring. For, the

Hollanders buſſes driving at Sea,do break the Shole;and then the Herrings fly near the ſhore,through the Sounds, where the *Scots* take them with their ſmall boats and nets. Had they better tackling,they would do better, *p.* 256,257. And, ***which is more than all,they have skilful and hardy Fiſhers,to endure wind and weather, and to be content with their own proviſions. Here a London-purſe,or a full Engliſh purſe would do wonders ; and the time draws neer to prepare for the buſineſs.*** In *Shetland* they had then fat Oxen, at 3 *l.* each Oxe; fat Sheep, at 2 *s.* or 2½ *s.* each fat Sheep; Conies, eaſie to be taken in abundance; and Fowl,*&c. p.*257. He bought in the Iſle of *Ounſt* 11655 gild Ling of the largeſt ſize, (if ſmaller, he had two for one, or three for two,) and 835 gild Cod, which are the largeſt Cod, all taken by the inhabitants of *Ounſt*; all brought to his booth or the place of his abode,as ſoon as they were cought, every morning. The large gild Ling did coſt him but 3 *d.* a piece; the gild Cod but 2 *d.* a piece. They were ſalted aboard the Ship, *p.* 254. *Muffet* values a Ling of 2 years old at a Noble, as the uſual rate in his time, about 60 years ſince,or upwards: And the price of fleſh in *London* and other parts of *England*,may now juſtly raiſe the price of Fiſh.

Our Author goes on to ſhew, that Trading is the life of all the habitable world, how it firſt raiſed the *Venetians* ; then the *Genoueſes*; next, the *Portugues*; then the *Eaſterlings*; laſtly the *Hollanders*,above all,by the Fiſhery, *p.*258,259, &c. He proves by accurate Inſtances, and grounded Calculations, that (ſo long agoe) *Hollanders* and other Forrainers, gained by their Fiſhery from the Coaſts of *England*, *Scotland* and *Ireland*,to the value of Millions of pounds yearly. And hence is their abundance of Shipping, Pilots, Seamen. And he ſhews, how the *Hollanders* do exchange their Fiſh,to drive their main Trade, and to circulate the wealth in the world into their own Centers and Purſes.

Compare herewith Mr. *Evelyns* lately publiſh'd ingenious Diſcourſe of the *Original and Progreſs of Navigation and Commerce*, eſpecially *p.*107,108,109,&c. printed in *London* in 8°.

III. Davidis von der Beck, *Mindani*, Experimenta & Meditationes circa *NATURALIUM RERUM PRINCIPIA*, *&c.* Hamburgi, 1674. *in* 8°. *dedicated to the* Royal Society.

BEfore any thing be ſaid here, about the particulars contained in this Treatiſe, the Publiſher thinks himſelf obliged to obſerve to the Reader a great miſtake which the Learn'd Author of this Book commits in adſcribing theſe *Philoſophical Tranſactions* to the *Royal Society*, as if thoſe of that Illuſtrious Body were the Authors and Compoſers of them; whereas 'tis well known, and hath been ſeveral times declared and inculcated in theſe very *Tracts**, that 'tis far otherwiſe, and that none but one particular Member of the ſaid Society, is the Compoſer and Publiſher of the ſame. Which being thus premiſed, 'twill not be amiſs, further to take notice here of the occaſion, that hath been given to our Author of writing this Book, which ſeems to have been the laſt Clauſe of the Deſcription, formerly given in *Numb.* 92. of theſe *Tracts p.* 5192. concerning the Pre-exiſtence of the Fixt and Alcaliſate Salts in Mixts before Calcination, and the Cauſes of Volatilization, both treated of by our Author in his *Epiſtle* to Dr. *Langelot*, abbreviated in the ſaid *Numb.* Which doctrine of his, that he might clear up the better, he thought fit to deliver his opinion about the firſt Principles of Natural Things; which he endeavours to do in this Treatiſe; *Firſt*, by rejecting the *Four Peripatetique Elements*, and the received *Principles* of the *Chymiſts*, from being the firſt Principles of Natural bodies, * *Secondly*, by aſſerting *Elementary Water*, and *Seeds*, to be the true Principles of them; and making ſuch Water the ſole *Material*, and the *Seeds* of bodies, the ſole *Formal* Principle; and affirming theſe two ſo to concurr to the conſtitution of all Corporeal beings, that the *former* is the Matter common to them all, and the *latter* the Form diverſifying that indifferent Matter into an innumerable variety of Bodies, by means of an Univerſal Celeſtial Acid, the proper ſeat of all Seeds, and coagulating this Elementary water into the

* See Numb. 12. p. 213. Numb. 86. p. 5047.

* See, and Compare herewith the Honourable *R. Boyle's* Sceptical Chymiſt throughout; publiſht *A.* 1661. in *Engliſh*; and *A.* 1662. in *Lat.*

various bodies of the Univerſe *.

Here he takes occaſion to diſcourſe largely of the nature of *Fire*, the better to evince, How *that* deſerveth to be counted a Principle of Natural Bodies, after he had affirmed, that *Acids*, which he maketh to be Fiery Subſtances, as they are the domicil of Seeds, by their motion and coagulating power do diverſify the Common Elementary Water into thoſe various Bodies, of which this world is made up.

Fire then, according to him, *is a moſt ſwift Motion of a Volatil acid Sulphur*; the Motion of particles being the *Forme* of Fire, and the Volatil acid parts the *Matter* that's moved. Where he maketh a digreſſion to ſhew the Inebriating power of *Acids*, and how effectual *Alcalies* are to retund and mortifie that vertue. Which done, he proceeds to elucidate further the nature of Fire from Oyles and Fats, and to make it out by Experiments, that the matter of the Flame of burning Oyles are their *Acid* particles; for as much as Oyles prepar'd by evaporating Spirit of wine from them, or by abſtracting them from quick lime, or by diſtilling them even from bricks, do not flame ſo much as they would do otherwiſe; which way of preparing Oyles he conceives to conſiſt in nothing but the deſtruction of the Acid particles thereof: Obſerving further; that Candles made of Mutton-Suet burn away much ſooner than thoſe made of other Suet, by reaſon of the abundance of *acid* particles in the ſame, far exceeding thoſe in other Kinds of fat, *&c.*

Having diſpatch't this argument, he goes on to prove more fully; *Firſt*, that the *Seeds* of things are harbour'd in ſome *Acid* or other, more or leſs manifeſt: *Secondly*, that all bodies are from *Water* coagulated into various *Species*'s by *Seeds*. Where he infers, that that Seminal Acid of Fats being conſum'd by Flames, the remainder, now deprived of that Acid, is reſolved into Elementary water, and inſenſibly diſſipated into vapours; as the aqueous parts of the moſt rectified Spirit of wine, being put into flame, fly away together with the Spirit in vapor. Where he takes no ſmall pains to *demonſtrate*, (*as his Expreſſion is*) the Acidity of Flame; and withal to ſhew, that in all Inflammable bodies

* *Quære*, what is meant by this *Elementary water*? And, Whether, if it be *Inſipid Water*, or any, how ſimple ſoever it ſeem, may not be reducible into ſomething elſe? And what, if this water, here call'd *Elementary*, ſhould be all convertible into Earth? As it hath been actually tranſmuted into it by *Mr. Boyle*. See his Book of the Origin of Forms and Qualities *p.* 258. exp. 9*th*.

dies there are Acid particles, that may juſtly be called *Fire*,and that there is ſuch a Fire in the Stomach of all Animals,and even in the ventricles of all Muſcles; (for,according to him,every Muſcle and part of the body hath its peculiar ventricle or ſtomack, which impregnates the aliments convey'd to them with the Seminal acid of the part, whereby the nouriſhment is turn'd into the nature of this or that muſcle, or nerve, vein, artery, or any other part.) And as this Fire is by him placed in all Animals,ſo he endeavours to prove it to be in all Minerals and Vegetables,whereby the matter, convey'd to them for their nouriſhment and increaſe, is,according to the diverſity of the Seminal acid Sulphur, converted into this or that Mineral or Plant.

Again, in that part of this Book, where the Author maketh it his buſineſs to prove, that the *Tria Prima* of the Chymiſts are not the true Principles of Natural Things,he undertakes, where he treats of that reputed Principle, *Salt*, to bring clearer proof of what was formerly ſaid in *Numb.* 92. of theſe *Tracts* not to have been ſufficiently prov'd, *viz.* That the fixed Alcaliſate Salts do as ſuch by no means pre-exiſt in Bodies before Calcinations; after he hath firſt diſtinguiſh't between the *fixt* Tartareous Salt that is in all the Juyces of Vegetables really and formally, without calcining them, (of which he ſaith he ſpeaks not,) and the fixt *Alcaliſate* Salt of the Tartar *e.g.* of Wormwood,which he poſitively affirms not to have formally pre-exiſted in the body before calcination,becauſe he will have that produced by the colliquation made by the fire of the Volatile Salts with the terreſtrial parts of the body; and the Union of the Terreſtrial parts with the Saline to be the ſole cauſe of Fixity: as on the other hand he maketh the ſeparation of thoſe Earthy parts the true and only reaſon of Volatility. Which whether he hath evinced by ſuch irrefragable proofs,as he thinks, we muſt ſtill leave to truly Philoſophical and ſagacious Chymiſts to judge; and ſhall only take the liberty to demand, whether he be ſure, That two Acids may not without any Terreſtreity be ſo combined and brought into ſuch a Texture, as to afford a Fixt Body, that ſhall endure a conſiderable degree of heat before it be ſublimed or volatilized? Which that they may,we have hopes to find proved experimentally in an Eſſay of Mr.*Boyle*,in due time to be publiſh't about the Mechanical Production of the Qualities of Bodies.

As to the Principles eſpouſed by our Author, *viz. Water* and

Seeds, and the large proofs he brings to aſſert them, we ſhall here ſay nothing, but deſire the Intelligent Reader to compare his whole diſcourſe with that of the Noble Author of the Conſiderations about the *Excellency and Grounds of the Mechanical Hypotheſis*; Which we have already given ſome accfnnt of above.

Mean time we cannot but commend this Philoſopher for taking particular notice of that admirable work of *Nutrition*, whereby, *for inſtance*, an Oxe grows in all and every part of his, whether it be Muſcular, Bony, Cartilaginous, Nervous, &c. only by graſs and plain water, which paſſing into the Head, Heart, Lungs, Liver, Arms, Feet, *&c.* do become each of thoſe parts reſpectively, and doing ſo, give us to conſider, that each part contains ſomething peculiar, that is not in any other part, by means whereof the aliment conveyed thither is converted into the nature of (*e.g.*) the Heart, not the Liver, the Lungs, not the Spleen, *&c.*

But, how he comes to make ſuch an eſtimate, that that part of a Seed, in which properly the prolifique vertue lodgeth, and which is ſtrictly called the *geniture*, is no more than the two thouſandth eight hundredth part (2800) of its body; and who are all thoſe *genuin* Philoſophers whom he appeals to *p.* 173, 264; I ſhould be very glad to be informed of.

After he hath amply diſcourſed in general of the nature of Seeds and the Seminal idea or character; he proceeds to particulars, applying his general diſcourſe to the generation of Animals, Vegetables and Minerals. Of *Animals* he taketh in hand the Nobleſt of them, *Man*, and giveth a large account both of his Formation in the womb, and his Nutrition when brought into the world. Where do occur many Obſervables, touching the active power of the ſeed of the Female, the production of Viviparous animals from Eggs, the manner of Conception, the gathering of the Seed from all the parts of the Animal, and the imprinting of the particular characters of each part in the Blood moving through the whole body, and by the Blood, as a vehicle, to the organs of generation: Further, the cauſe of the determinate ſizes of animals, eſpecially of Men, Pigmies and Giants; the ſtrange force of Imagination exemplified; the ſufficiency of the ſeed of the Male to impregnate many Eggs at once, eſpecially of a Cock; the cauſe of Monſtroſity; difference of Sexes; and death; of the remaining of the Idea's or Characters in the Bodies of Animals

nimals after death; to which he joyneth his thoughts about the Reſuſcitation of Plants.

Having finiſh't this part concerning *Generation*, he goes on to ſhew, how *Nutrition* is materially perform'd in all ſorts of Bodies, *viz.* by water alone; which he endeavours to make out by reaſon, and authority, particularly alledging for his authority *Van Helmont* and Mr. *Boyle*; the latter of which I much apprehend to be miſ-underſtood by our Author in this particular; as he is alſo miſtaken by the ſame, when he is introduced as a perſon judging, that *Van Helmont* (for whom he hath yet a juſt eſteem,) by reaſon of the incredible veracity of his Experiments is not eaſily to be disbelieved; for which allegation, I think, no place of Mr. *Boyle* can be produced out of any of his works to run in that latitude.

And as this Writer believes *Water* to be the Material principle of all things, ſo he attempts to ſhew, What that power and vertue is, which coagulateth the Water into ſolid Bodies, and applieth it to theſe Seminal characters, which he had afore diſcours'd of; and this he maketh to be the *Igneous and Vivifying Spirit*, lodged by the Creator in the *Sun*, and convey'd to the ſeveral bodies of the Univerſe by the Air and Wind, imbued with thoſe vital and benign rayes of the Solar globe: Which Spirit though it be, according to him, but one, and, before it be incorporated, indifferent to make fæcund the bodies of all the three Kingdoms; yet it acquires its ſpecification, or is determined according to the determinate nature of the Seeds; and the moſt ſubtile parts of that Spirit being acid, they do by this acid power coagulate the water into ſolid bodies.

ERRATA in this *Numb.*

Pag. 41. l. 12. r. *Mechanical*, p. 47. l. 29. r. *Vitriolate.*

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PHILOSOPHICAL TRANSACTIONS.

June 22. 1674.

The CONTENTS.

The Obſervations and Experiments, begun Numb. 103. *about* Vitriol, *continued ; ſhewing, that* Vitriol *is uſually produced by* Sulphur, *acting* on, *and concoagulating* with, *a Metal ; and then making out, that* Allom *is likewiſe the Reſult of the ſaid Sulphur ; as alſo evincing, that* Vitriol, Sulphur, *and* Allom *do agree in the Saline principle ; and laſtly declaring the Nature of the Salt in* Brimſtone, *and whence it is derived: Where 'tis intimated, that* Common Salt, *together with the* Aerial Salt, *is the foundation of all Saline ſubſtances in the Univerſe. An Extract of a Letter of M.*Hevelius, *containing a Narrative of Dr.*Waſmouth, *about a New Aſtronomico-Chronological Work, now by him preparing. An Accompt of ſome Books :* I. *Obſervations touching the TORRICELLIAN EXPERIMENT, and the various Solutions of the ſame, eſpecially concerning the* Weight *and* Spring *of the Air.* II. *A MATHEMATICAL COMPENDIUM, collected out of the Papers of Sir* Jonas Moore, *by* Nicholas Stevenſon. III. *Icones & Deſcriptiones RARIORUM PLANTARUM Siciliæ, Melitæ, Galliæ, & Italiæ, Auth.* Paulo Boccone, *Panormitano Siculo.* IV. *NAVIGATION and COMMERCE, their Original and Progreſs, &c. by* J.Evelyn *Eſquire.*

A Continuation of the Diſcourſe concerning Vitriol, *begun in* Numb. 103; *ſhewing, that* Vitriol *is uſually produced by Sulphur, acting* on, *and concoagulating* with, *a Metal*; *and then making out, that* Allom *is likewiſe the Reſult of the ſaid Sulphur*; *as alſo evincing, that* Vitriol, Sulphur, *and* Allom *do agree in the Saline principle*; *and laſtly declaring the Nature of the Salt in Brimſtone, and whence it is derived.*

THat the Vitriolat Salt in *Common Sulphur* differs little from the Salt in *Vitriol,* will appear evident to them, who will compare with the common Spirit or Oyl of Vitriol the Acidity of Sulphur afforded by Brimſtone inflam'd under a Glaſs-bell; which being rectified is not to be diſtinguiſh't by any ſenſible property from the well-rectified Acidity or Oyl of good Vitriol; and they may, I am confident, be ſafely ſubſtituted for each other, producing in Men and Metals the very ſame effects, being, in any apprehenſion, no leſs alike in their *internal* and ſecret, than in *external* ſenſible qualities.

The Quantity indeed of Acidity, which is obtain'd in the ordinary wayes of operation, is very ſmall, a pound of Brimſtone not yielding above *one* ounce or *ten* drachms; the far greater part being by the rapid motion of the flame ſublim'd in the form of *flores*, which differ not from the Common flowers. I have been often aſſur'd by a kinſman of that admirable Mechaniſt, *Cornelius Drebbel,* that his Uncle did, by the means of conveniently ſhaped veſſels, ordinarily obtain out of a *pound* of good Brimſton, *eight*, and in a very moiſt ſeaſon, *ten* ounces of Acidity; and was confident, he could, by improving the contrivance, recover the entire weight of the Sulphur; the moiſture of the Air acquired making abundant recompence for the avolation of what is Incoagulable. I have my ſelf, by the means of ſeveral *Menſtrua*, reduced *common Brimſtone* into the form of an highly Acid corroſive liquor; and even *Spirit of Niter*, or *Aqua fortis* well rectified, being digeſted on the flowers of Brimſtone, then diſtilled in aſhes, this repeated five or ſix times, after the laſt cohobation there will remain with the flowers near their weight of an Acid Spirit, like that made by a Bell; the Spirit of Niter being ſcarcely changed from what it was before the operation: And, I ſuppoſe, *that* being reiterated frequently, eſpecially if freſh Spirit be employed, the *whole* may be tranſmuted, abating ſome few *earthly* and *metallick* particles; the *ſulphureous* being capable of a fluid form, and are copious in Oyl of Vitriol, *Aqua fortis*, and many other Acid *Menſtrua*, eſpecially if any imperfect Sulphureous minerals were imployed with the other Ingredients in their production.

I once made out of Vitriol, Common Salt, and Antimony, a liquor cleer as any fountain-water; yet the Smell intolerably ſulphureous, continuing ſo many years: And true inflammable Sulphur may ſeveral wayes be recover'd out of Oyl of Vitriol, or Sulphur, many times rectified, and in appearance free from ſuch mixture. We formerly mention'd its ſeparation by means of Vinous Spirits. Alſo, if mixt with Oyl of Turpentine, and diſtilled, at the latter end ſtore of Brimſtone will ſublime: I ſuppoſe, none will aſcribe this to the Vegetable Oyl, which is only the means of its ſeparation, being an appropriate *Menſtruum* or Diſſolvent of Sulphureous bodies. This recalls into my mind what I *have* often obſerv'd, (and I ſuppoſe it alwayes happens) in the preparation of *Balſome of Sulphur* with the ſaid Oyl of Turpentine: After the Oyl is ſatiated with Sulphur, it lets fall ſtore of fair Cryſtals; an evident proof of its Saline nature: For, although theſe Cryſtals broken, *within* appear full of *Sulphur*, their *outward* parts or ſuperficies ſeem perfect *Salt*, by vertue whereof they are diſpoſed to cryſtallization. It may indeed be objected, that Cryſtallization is not a ſufficient proof of a Saline nature, the Eſſential oyles (as they are called) of Anniſeeds, Fennelſeeds, and of many other ſubſtances being very prone to cryſtallize, where there is no ſuſpition of their abounding with Salt. But this Objection is ſo far from invalidating my aſſertion, that it rather confirms it, moſt Eſſential Oyles abounding no leſs with ſalt than common Sulphur, into which I have often converted them without additament or ſuſpition of

Tranſmutation: Which, together with ſeveral other Experiments and Obſervations, induce me to embrace that lucky, or rather judicious, conjecture of the deſervedly admired *Carteſius*, *That* Sulphur *conſiſts of Saline particles incloſed in ſtore of branched Oleaginous matter; and may be predominant in ſome ſubſtances, but is no where pure and ſeparat from the other principles; for then it would immediately vaniſh into Air; being alwayes mixt with* either *Salt*, or *Earth*, *and then it appears in a* dry *form*; or *with Water and Spirit*, *and then in a* fluid.

But to return whence we digreſſed; Nothing can more fully demonſtrate any Truth, than the conſideration of the following Experiment doth the *Affinity*, I had almoſt ſaid, *Identity* of the *Saline* principle in *Sulphur* and *Vitriol.* Take thin plates of Copper, cement them carefully with common Brimſtone, *ſtratum ſuper ſtratum* (as Chymiſts love to ſpeak) repeat the operation four or five times with freſh ſulphur; moſt of the Copper will be converted into Vitriol, which diſſolved in water, and moſt of that evaporated, it yields very beautiful Azure cryſtals. The ſame may be effected with *Iron*. Or take the Acidity of Sulphur (corruptly called its Oyl) moiſten therewith filings of Copper or Iron; then free them by Fire or Air from ſuperfluous moiſture; repeat this twice or thrice; and afterwards with common water you may extract a fair Vitriol, which by the Chymiſts is called *Vitriolum Martis* or *Veneris*, according as the one or the other metal was imployed in order to its production; which ſame metals being diſſolv'd in any Acid *menſtrua*, and cryſtallized, are converted into Vitriol. This is ſignified unto us by the common name of Vitriol, vulgarly ſtyled *Cuperoſum*, quaſi *Cuprum eroſum*; that being the metal wherewith 'tis uſually aſſociated. Sulphur indeed is found mixt with moſt metals and minerals, Gold and Silver not being excepted; the moſt expert Mineraliſts in *Peru* accounting abundance of Sulphur an eſpecial ſign of rich Ore: And among the richeſt Ore of the mountain *Potoſi* * are ſuch quantities of Brimſtone, that the cavities and hollow places are preſently filled with flame, if

* *See* ch. 19. *of the firſt Book of Metals, declaring the manner of their Generation, written in Spaniſh by* Alonſo Barba, *and tranſlated into Engliſh* A. 1669.

a Candle touch or come very near their ſides. Yet they do not ordinarily find Vitriol in Mines of Gold and Silver (unleſs mix'd with other metals) becauſe thoſe bodies are ſomewhat too compact for the ſulphureous ſpirit to diſſolve aſſiſted with a *ſmall* degree of heat; whereas all Ores, which touch on Copper or *Pyrites* abounding in Sulphur, do alſo afford Vitriol; Copper being an open body, and more eaſily ſoluble than any other metal: For, it will preſently, though crude, diſſolve *in*, and give a deep tincture *to*, common Volatil Urinous Spirits; which cannot be affirmed of any other metal, howſoever prepared; and therefore no wonder if it be by the ſteam of ſulphur ſo eaſily converted into Vitriol: And in the bowels of the Earth it is, I do conjecture, moſtly produced after this manner;

An Acid Salino-ſulphureous ſteam (ſuch we have proved that of Common Sulphur to be) inſinuating it ſelf into a vein of Copper, corrodes it, and uniting therewith becomes Vitriol. So it doth by mixture with Iron and other Minerals; whence being waſhed by water, it produces *Acidulæ* of divers kinds, according to the nature of the Minerals, wherewith the Acid is united. And that Vitriol and Vitriolate waters are thus produced, is hereby confirmed, that many Ores and *Pyrites* being diſtilled *per deſcenſum*, yield abundance of Common Sulphur; the remainder afterwards affords ſtore of Vitriol, although before calcination it would have yielded none; the fire enabling the ſulphur to corrode, and aſſociate with, the metallick parts; that which is without mixture of metal, or which hath thereof a very ſmall proportion, continuing under the form of Brimſtone.

This to me ſeems the reaſon, why Vitriol and Brimſtone are uſually found together, thoſe minerals and pyrites that abound with one, being uſually impregnated with the other; Vitriol not being a diſtinct principle, but the genuin off-ſpring of Sulphur, its Material cauſe, and Fire and Air the Efficient cauſes of its production. I ſpeak of Vitriol generated *in* the bowels of the Earth; for it *may be*, and *is*, often produced *above* ground by the Aerial Salt united with Mineral ſubſtances, copiouſly contained in Marcaſites, which it extricates, and concoagulating therewith becomes a Vitriol.

You will not, I ſuppoſe, be much ſtartled at theſe words, *Aerial Salt*, after the credit you have lately given a Diſcourſe concerning the *Volatil Salt of Vegetables*, which upon their Putrefaction or Arefaction expiring into the Air, *that* muſt neceſſarily abound therewith, beſides abundance of the ſame ſubſtance, which tranſpires from Animals, and is ſublimed by ſubterraneal Fires, whereof I may hereafter render you a more particular accompt. I ſhall at preſent only affirm, that this *Aerial Salt*, which I have many wayes procured, whilſt in the Air, is altogether un-ſpecificate, I mean, freed from all Union with, or determination by, any Seminal principle; (the Primordials of all *ſpecies* in the Univerſe being in my opinion Spermatical;) but being once at the command of the Architectonick power of any *ſpecies*, whatſoever *that* be, it is by it, with other matter, determined in order to the Formation and Augmentation of the *Individuum*, and Propagation of the *ſpecies*, and, upon the diſſolution of its dwelling, returns whence it deſcended. Beſides this, there is alſo in the Air an Acidity, as is evident in Iron-bars, whoſe ſuperficies is thereby reſolved into a ſubtile *crocus*; alſo in the tarniſhing of poliſh't metals, where Pit-coal is much burnt, near unto and on the Sea, and where expoſed to certain winds; Truths ſo common and obvious, that I need not expatiate on, or much labour to confirm, them.

This Acid Spirit with the Salt laſt mention'd are Inſtruments by Nature imployed in almoſt every operation; eſpecially the Salt, without which no perfect Animal can ſubſiſt a minute, and all Vegetables deprived thereof do immediately cay. I ſhall in this diſcourſe have regard unto them only as they contribute towards the production of Salts. Its well known, that ſeveral Minerals and *Pyrites*, which are to the taſt altogether inſipid and elixiviated, would yield not a grain of Salt; being expoſed unto the *Air* are reſolved into a powder, and afford, ſome, Allum, others Vitriol copiouſly. Sometimes the Minerals require previous Calcination, which opens and relaxes the *compages* of the bodies, ſo that the Air may have more eaſie ingreſs. And it is, I think, by moſt allow'd, that, after all the Salt is extracted out of Earth impregnated with

Vitriol, Allom or Nitre, the ſaid Earth being expoſed a ſufficient time unto the Air, acquires freſh ſupplies, and that in ſuch quantity, that many have concluded (which I can neither contradict nor confirm) that in an hundred or ſome few more years the Earth would yield more Salt than its whole bulk amounted to in the beginning of the operation; a great, if not the greateſt, portion whereof muſt be derived from the Air. And it is particularly remarkable in Vitriol and Allom, that their Spirit being put into a Commotion or Fermentation by either heat or contrary-natur'd ſpirits, the glaſſes which contain them being well cloſed, although large and ſtrong, will be crackt or broken in pieces; which ſeems to proceed from the expanſion of ſome of thoſe prodigiouſly active Springy particles, wherewith the Air abounds, which together with the Aerial Salt were arreſted by the Vitriolifying principle, and ſet at liberty by the tumultuating liquor, the change of whoſe contexture might occaſion their diſmiſſion, the unbending of their Springs, and the effects which thereupon enſue. But, whether the Vitriolate *Marcaſites* are only Magnets, to attract and ſpecificat the Aerial Salt and Spirit; or whether theſe are as well Active as Paſſive, ſeparating, comminuting, and after combining with the Mineral particles, ſo that the reſult is different from what either of them were before ſuch union, I leave unto farther Enquiry: For, though I could ſay much on this occaſion, yet I ſhall defer it, until ſome few more Experiments have enabled me to make more perfect diſcovery of a Truth, which is not ſo obvious as moſt may imagine.

I ſhall now proceed to demonſtrate unto you the affinity between *Allom* and *Vitriol*; I mean, the *Natural*, not common *Factitious* Allom; Sea-ſalt, Alcalies, and Urine being uſually imployed in its production. Now, *Vitriol* not only in *England*, but in ſeveral other parts of the world, is ordinarily found in the ſame Vein, and ſometimes in the ſame parcel that yields the Allom; which may by ſeveral methods be ſeparated from each other. The mineral of *Allom*, if mature, elixiviated yields its ſalt preſently; if leſs mature, it requires previous Calcination; if very immature, it muſt not only be burnt, but long expoſed unto the Air. The cauſe whereof ſeems the very ſame with that we lately mention'd in our account of the production of *Vitriol*; the *Allom*, as *that* is, being produced by the Sulphurs acting *on*, corroding *of*, and concoagulating *with*, ſome Mineral ſubſtance, which uſually partakes more of terrene and ſtony, than metallick, nature; although yet Metal is often found to be contained in the Allom, Stone or Ore. And that the Sulphur is the chief Efficient and Material cauſe of its production, appears from hence, that many Allom-ſtones (as the Vitriolate) diſtilled *per deſcenſum*, yield good Brimſtone; and all Allom,ſtones or Ore, during Calcination, emit a ſulphureous Steam. An Inquiſitive Naturaliſt of my acquaintance did gather from the very ſame rock, and that within a few inches of each other, Vitriol, Allom, and Sulphur; all of them excellent and perfect in their kind. Indeed they are ſo neerly allied, that I can by ſome pretty artifices (too long to be here deſcribed) convert Allom into Vitriol, or Vitriol into Allom, which ſhall be the ſame to all intents and purpoſes (as we commonly ſpeak) with the Natural.

Allom diſtilled into an Acid ſpirit with Copper or Iron, becomes good Vitriol; and *Vitriol* freed from its metallick parts becomes Aluminous; and diſtilled,yields a Spirit ſcarcely to be diſtinguiſht not only by taſt, but even by the moſt nice and accurate ſcrutiny, from that of Allom. And (which doth in ſome meaſure illuſtrate this Affinity) I have often obſerv'd rectified Oyl of Vitriol and Spirit of Sulphur to coagulate and become ſolid tranſparent concretions, exactly reſembling Allom cryſtallized, with which compared, I am confident, the moſt judicious Eye, without the aſſiſtance of the palat, would find little difference.

Having analyſed *Vitriol*, and ſhewed, that it is uſually produced by Sulphur acting on, and con-coagulating with, a metal; and that *Allom* is the Reſult of the ſaid Sulphur,comprehended in, or united with, bodies leſs metallick and more terrene; and having, I think, fully evinced, that Sulphur, Vitriol, and Allom do agree in the Saline Principle, which is in all originally the ſame, perhaps a little changed by the bodies with which it is aſſociated: It remains, that I ſhould declare the Nature of the Salt in *Brimſtone*, and whence it is derived.

Brimſtone conſiſts of *Mineral* Sulphur, and an *Acid* Salt, which being united, it is no difficult matter to conceive, how it ſhould become Volatil, if we reflect on *Cinnaber* and *Sublimate.* In *one*, Mercury is ſo diſguiſed by a little ſulphur, that it ſeems a Mineral ſubſtance of another nature, and, abating the colour, not unlike Antimony: In the *other*, Salts very acid and fixt are rendred ſufficiently volatil. Now, whence the Brimſtone ſhould derive its Sulphureous particles, will appear very obvious to them, who have obſerved, how much the bowels of the Earth abound with bituminous ſubſtances. What elſe feeds all the ſubterraneous fires? What an immenſe quantity thereof is lodged in the Earth, will be atteſted by our large and numerous Coal-mines, and by thoſe Eruptions of bituminous ſubſtances in many quarters of the world, among which that, called *Naphtha*, is ſo purely ſulphureous, ſo free from mixture with any other materials, that upon the very approach of fire or flame it is immediately inflamed, and ſcarcely to be extinguiſht, until wholy conſumed. As for the *Saline* principle of Sulphur, I conclude it to be *Common Salt*, which, together with the *Aerial* Salt before mentioned, is the foundation of all Saline ſubſtances in the Univerſe. How it comes to be ſo much diverſified by ſtrong and violent heat, or long and eaſie digeſtions, as alſo by its acting *on*, and combinations *with*, particles of different nature; I ſhall at your next ſummons endeavour to make manifeſt, it not being an ungrounded fancy, but a perſuaſion derived from many Experiments and long Obſervation. I ſhall at preſent only aſſure you, in reference to the preſent diſcourſe, that I can with *Common Salt* make both *Vitriol* and *Allum*, hardly diſtinguiſhable from the Natural.

An Extract of a Letter of Monſieur *Hevelius*, lately written to the Publiſher, together with the Copy of a Letter of Dr. *Waſmuth*, giving a large Account of a New *Aſtronomico-Chronological* Work, now by him preparing. Both deliver'd in the ſame Language, wherein they were written.

—P*Ræterea cùm nihil hac vice relatu dignum occurrat, quod vobis communicare poſſim; ecce copiam literarum ad Amicum quendam meum exaratarum, de libri cujuſdam, à Cl. Doct.* Waſmutho, *LL Orientalium* Kiloni *Profeſſore, conſcripti argumento. Titulus eſt perquàm ſplendidus; miráq; Aſtronomis & Chronologis pollicetur; ſed, num res ipſa promiſſis reſponſura ſit, eſt quod valdè dubitem. Profectò ſi præſtare ea poſſet, omnes Aſtronomos maximâ curâ & moleſtiâ, multóque labore, qui nos diu noctúq; torquet, liberaret, nec foret opus impoſterum Cælos tanto ſtudio contemplari. Quid veſtratibus, rerum Cæleſtium Inſpectoribus, hac de re videatur; numq; hac res abſq; Veterum & Recentiorum Obſervationibus eò, quò Ille vult, deduci queat, haud gravatim exponas, quæſo.*

Sequitur ipſum Apographum
Epiſtolæ Waſmuthianæ.

Quandoquidem præſens fert occaſio, per Clar. Tuam Magnifico veſtro Hevelio, *ceu Aſtronomorum ævi noſtri Celeberrimo, quædam mei, nunc ſub manibus verſantis, Operis Aſtronomo-Chronologici præmetia communicandi; velim, Clar. tua Viro ſummo per occaſionem indicet, me, enatâ mihi anſâ ex Dn.* Calovii *Diſcuſſione* Ravianæ *Chronologiæ, moliri jam ferè per triennium* Opus *quoddam* Aſtronomo-Chronologicum; *quod, uti à me conceptum, & maximâ parte jam effectum eſt, ſuſtinere poſſe, citra jactantiam, putem hunc Titulum:* Annales Cæli & Temporum perpetui, ſive, Myſteria Aſtronomo-Chronologica, à ſeculo abſcondita, nunc per Dei gratiam detecta & evidenter aſſerta Libris III^{bus}.

Quorum primus (1.) *deſtruet illam hactenus vulgatam Aſtronomorum hypotheſin de duplici Motu Corporum Cæleſtium contrario; altero, Primi Mobilis, Motu* Raptûs *dicto, in Occaſum; altero, proprio Secundorum Mobilium, in Ortum; ex quo propter im-*

impares paribus temporibus motus,omninò ſtatuenda ipſis venit Inæqualitas Arcuum Cæleſtium, adeóq; Apogeum & Perigeum cum Excentricitate (eâq; quibuſdam biſectâ,aut plurium Epicyclorum) atque exinde motuum cæleſtium non apparens modó & Optica quoad viſum noſtrum, ſed & realis & Phyſica inæqualitas (quâ tamen indignius nihil perfectioni motuum illorum tribui poſſe, Ipſimet in Riccioli Almageſto conqueruntur;) tum & univerſim varii & inexplicabiles ideó labyrinthi Mobilium Secundorum extruuntur, è quibus nullum unquam duxeris Ariadnæ aut computi laborioſiſſimi filum; quibuſque per Geometrica Schemata delineandis & explicandis docentes juxta ac diſcentes ſubinde fatiſcunt viribus ingenii. At cujus loco Unus nunc, iſque intellectu facillimus à Nobis aſſeretur omnium Mobilium Cæleſtium motus Simplex Spiralis,ab Ortu in Occaſum,harmonico ejuſmodi temperamento aliorum Celeriorum, aliorum Tardiorum,eorumque modò ſublimius Spiraliter aſcendentium à Terra, modò humilius eidem appropinquantium, ut per hanc, aliorum poſt alios tardantium, ſeu remanentium ſpiraliter, diverſitatem (non tam Aſtronomicâ aliquâ Hypotheſi,quàm veræ realitatis Theſi) omnia illa phænomena, etiam Directionum, Stationum, & Retrogreſſionum in Planetis, non modò perfectè poſſint ſolvi, ſed & cauſæ evidentes tum Illarum, tum Progreſſionis (veriùs,Remanſionis ponè ſectiones Vernales) Stellarum Fixarum verſus Ortum, nec non omnium Æquationum proſthaphæreticarum inter motus Medios & Veros (nunquam hactenus ab ullo Aſtronomo datarum) ritè illinc pateſcant: Ruente hinc ſimul Syſtemate Copernicano (cum Scriptura S. adeò collidente, licèt à plurimis & præcipuis hodie recepto,)& veriori ſubſtituto,quod Ptolemaico ſit affine, ſed ſine Orbium diverſorum realitate.(2.)Cùm hactenus omnibus omnis ævi Aſtronomis confeſſa ſit impoſſibilitas determinandi Annum Solarem Tropicum ad minuta uſque, adeò ut Ricciolus, poſt 50 ferè principum Aſtronomorum diverſas de eo ſententias, adhuc fluctuet ſuo, Nos interim, (uti de hoc, ita paſſim de aliis omnibus per totum Almageſtum;) Mihi, per Dei gratiam, Annum iſtum Tropicum Solarem in minutis uſque X^{mis} ita determinare licet, ut non modò à priori evidenter & apodictìcè demonſtrem, fieri id aliter non poſſe; ſed & à poſteriori demonſtrationis meæ veritatem evincam ex perpetua adeò Computi mei cum Annis Civilibus & Feriis Æquinoctialibus concordiâ, ut ab *initio Mundi, uno continuo & ſimili filo Temporum ac Motuum, initia Tropica omnium & ſingulorum annorum, tam in ſeculis præteritis, quàm hoc præſenti, ac proximorum, antè aut retrò, & futurorum (in infinitum ſi dentur) præciſè eâ feriâ hebdomadicâ, horâ ac minutis determinem, quibus ea eveniſſe & deinceps eventura, Ephemerides (correctiores ſubinde per Obſervationes novas; alioquin, ex iiſdem ſemper Tabulis quibuſcunque Motuum ſi fuerint deducendæ, quo plurium ſeculorum, eò magìs aberraturæ) concorditer exhibent: Quin imò, non ſolum Tropica illa initia Annorum, ſed etiam, per exactiſſimas Æquationes proſthaphæreticas diurnas, præfinio non minùs præciſè ipſos Tropicos Solis ingreſſus in unumquodque Signum & quemlibet Signi gradum, quâ ſcil. feriâ hebdomadicâ, quâq; horâ quibuſque minutis ſinguli illi fiant ſingulis annis; Ephemeridibus hîc pariter, quò recentioribus, eò minùs aberrantibus ad pauculas horas aut minuta: Aſtronomis ultrò fatentibus, circa Ingreſſus in Signa aut gradus Æquinoctiales determinare ſe certitudinem omnimodam ad certas horas non poſſe; cùm præfinitio mea ex uno ſemper æquabili Temporum & Motuum ducta ab initio Mundi ad quodlibet datum temporis punctum continuè deducatur, idque ſemper per Minuta uſque X^{ma}, & temporaliter & localiter. (3.) Cùm hacterus apud omnes in confeſſo ſit,* Commenſurandi Motus Solis cùm motibus Lunæ impoſſibilitas; *unde hactenus Aſtronomis poſt quantamcunque Obſervationum & Calculorum diligentiam, poſtque omnes Orbium, Epicyclorum atq; Excentricitatum regularitates & irregularitates, aut variationes, ſemper tamen Luna adhuc audit & eſt* Contumax Sidus: *Mihi nunc, Dei gratiâ, adeò morigera facta eſt, ut* non modò *cujuſcunque menſis Lunaris, tam Synodici, quàm Periodici, Dracontici (ſeu latitudinarii) & Apogealis (vulgò Anomaliſtici) quantitates temporales præciſè deſignem in ipſis minutis uſque X^{mis}; Tabulis quoque prolixè jam calculatis & in eam rem conſtructis (ita ſcil. ut ſemper reſpondeant phænomena, ſeu Ephemerides* correctiores; *vanis alioqui futuris omnibus harmoniarum commentis;)* ſed etiam, *quanti ſemper motus, tum medii tum veri, tum apparentes ſeu viſi, Lunæ, Periodici, Dracontici, & Apogeales, fiant, tam intra ſingulas Synodicas Lunationes, quàm intra ſingulos annos Solares Tropicos; & quantæ in iis omnibus* mediorum *cum* veris *Æquationes proſthaphæreticæ per totum M. contextum, quantiſcunque ſeculis, ſemper reſpon-*

reſpondentibus & reſponſuris ubique phænomenis: Unde & omnium Eclipſium totius M. præciſa tempora ſemper inveſtiganda & demonſtranda infallibilem Temporum ſeu Ætatis M. dare poſſunt Elenchum pro Computo Chronologico. Atque hæc omnia demonſtro ſeu deduco, primùm quidem è principiis Apocataſtaticis (reſtitutione ſcil. Solis & Lunæ, cum Stellis Fixis, prout initio mundi conſtiterunt; quam ex anni Solaris Tropici demonſtratâ præciſiſſimâ quantitate, & temporali & locali, perſpectiſſimè cognitam & definitam habeo;) inde verò à poſteriori, *per univerſalem perpetuámque motuum Harmonicorum cum phænomenis, quolibet dato momento mundi concordiam comprobo.*

Liber Secundus, *apodictìcè hinc reſtituet* Univerſam *fundamentalem* Chronologiam; *cùm & aliàs S. Scriptura Vet. Teſtamenti ſit fundamentum quidem multò veriſſimum Chronologiæ, at variis variorum expoſitionibus & tormentis Scripturæ ita labefactatum, ut in Ætate Mundi definienda, figendave Chriſti Æra, ipſi Chronologorum principes non annorum modò Centenariis, ſed & Millenariis, diſſidere ab invicem deprehendantur.*

Liber Tertius *denique proponet veram hinc & ſolidam* Unionem Temporum, *quâ ſcil. talis ſimul & ſemel fieri poſſit ac debeat correctio Styli Calendariographici, &* Gregoriani *&* Juliani, *ut nunquam deinceps aberrari iterum poſſit, aut ullâ correctione iteratâ egeamus (quali laborat* Gregoriana *illa, ſemper poſt* 400 *quoſque annos denuo corrigenda, Tridui ejectione;) dum ſcil. non quaterno quolibet anno (uti hactenus) ſed, ex Cæleſtis noſtri anni Tropici forma & quantitate, in Opere meo clariſſimè evictâ, quinto quoque anno, &, certis periodis, ſexto demum fiat Intercalatio ſeu Biſextilatio talis, quæ non egeat exemptili iterum ullo per omne ævum (cùm præſtet non abſtuliſſe, quàm ad reſtituendum teneri;) quâ ratione nunquam à Cæleſti tempore Civile tempus abibit: Prout ſcopum hunc & finem* Unionis temporum *exhibiturus ſum Orbi Chriſtiano, confirmaturuſq;, Deo porrò juvante; cujus auxilio, intra annum partem operis potiſſimam typis mandari poſſe ſpero.*

Quid ſuper his Magnifico Dn. Hevelio, *aliiſque Veſtratibus, hujus ſtudii peritis, videatur, reſcire avidiſſimè deſidero.*

Hucuſque Dn. *Waſmuthius*; qui ne ſpe & promiſſis ſuis ampliſſimis excidat, vehementer optamus.

An

An Accompt of ſome Books.

I. *Obſervations touching the TORRICELLIAN EXPERIMENT, and the various Solutions of the ſame, eſpecially touching the* Weight *and* Elaſticity *of the AIR.* London, 1674. *in* 8°.

THe Learned and Inquiſitive Author of theſe Obſervations, having thought fit not to prefix his Name to this Book, that ſo he might be the fitter (as himſelf intimates) to bear the correction of his Errors, if any ſuch ſhould occur to his notice; we have no reaſon to blame him for that omiſſion, but rather commend his modeſty and diffidence, and withall entertain the hopes of ſeeing ſomething publiſh't hereafter from the famous Patrons of the *Hypotheſis* by him impugned, that may either contribute to the further elucidation and eſtabliſhment of their Doctrine, if it be ſolid, or ſerve to rectifie their miſtakes therein, if it be ill-grounded.

Our Author then, taking this difficult ſubject in hand, profeſſeth in the beginning, that, to avoid the imputation of a Plagiary, he hath borrowed in this Controverſie ſome things from others, eſpecially from *Franciſcus Linus* and *Honoratus Fabri*, though he alſo delivers ſomewhat that's new, and makes the method and manner of Explication of it as much his own as he can; the which he performs in this order:

1. He explains ſome Terms which he hath occaſion to uſe in this Diſcourſe.

2 He ſets down ſome *Statical* Obſervations, neceſſary to this Inquiry; viz. concerning the Gravitation of water upon water; of Air upon Air or any ſubjected Bodies in it; of heavier Fluids upon thoſe that are lighter; and of lighter Fluids upon thoſe that are ſpecifically heavier. Concerning which particulars, he endeavours to prove, *firſt*; That the upper parts of water do not actually gravitate or preſs upon the lower parts of it; where yet he acknowledges, they do gravitate *ad pondus* and phyſically upon the lower, ſo as to make the whole heavier, though they do not gravitate *ad motum* or ſenſibly:

Which ſeems to be in effect the ſame with what the Honourable *Robert Boyle* with clearneſs teacheth in his *Hydroſtatical Letter*, printed *A.* 1672. upon the occaſion of ſome Exceptions made by Mr. *Sinclair* about a Way of ***Weighing water in water***; where he ſaith, that the upper portion of water does really *preſs* the ſubjacent, though it doth not actually *depreſs* it; or, doth ***gravitate*** on it, but not ***præ-gravitate.*** Mean time, this Author here pretends to prove the ſaid non-preſſing of water upon water both by Reaſon and Obſervation. After which he examins, whether the free and common Air, wherein we live, (commonly called *Atmoſphere*) extending upwards about ſeven miles or more, hath any ſenſible actual Gravitation upon the lower world; and admit it have, whether any determinat portion of that Atmoſphere, as a Column or inverted Cone, for the purpoſe of ſix inches ſquare at the baſe, hath any actual gravitation upon the ſubjected baſe, on which it is ſuppos'd to reſt; and ſuppoſing it have, whether that gravitation be of any conſiderable, and of what, moment? Where he denieth not, that Air ***compreſs'd*** may have weight in it, ſo as to gravitate conſiderably upon other Air, either not at all, or leſs, compreſs'd; nor, that even the *free* Air it ſelf may have ſome *intrinſique* gravity, though exceeding little; nor, that this free Air may have ſome, though very inconſiderable, meaſure of *actual* gravitation, which yet he thinks is ſcarce perceptible to ſenſe, notwithſtanding all the mixtures of vapors and ſteams from the Earth and Water. But that which he labors to maintain, is, 1. That the whole body of the Atmoſphere hath ***no conſiderable*** Gravitation either upon its own parts, or upon the ſubjected body of the Terreſtrial globe, much leſs ſuch a notable gravitation, as is ſuppoſed by thoſe he diſputes againſt. 2. That, if it had, yet any given portion or Column of the Atmoſphere hath no ſuch gravitation. Concerning the *former*, he thinks fit to ſay little, referring himſelf therein to *Franc. Linus* his Tract *de Inſeparabilitate Corporum*, and to *Hon. Fabri* in the ſixth of his late *Philoſ. Conferences*; and he ſcruples not to ſay, that there is not any Inſtance or Experiment, known to him, and alledged for the evincing of that pretended Gravitation of the free Air, but is readily capable of a more ſutable Solution, more adequately fitted to the *phænomena*, and leſs incumbred with difficulties, than the Solution of the *Weight* and *Spring* of the Air. As to the *latter*, he aſſerts; 1. That, tho we ſhould admit a conſiderable gravity of a portion of Air, taken and divided as one intire ſeparate groſs body (as in a Bladder, a Glaſs-buble, &c.) ſo that it partakes of the common quality of Heavy bodies; yet there is a peculiar preſſure or gravitation belonging to this ſubtile Fluid body, which hath its lines of direction *every way* within the compaſs of its own extream ſuperficies, whereby that Perpendicular gravitation, which is common to all bodies, is corrected, abated, and in a great meaſure ſuſpended. 2. If there were no ſuch allay given to its common Perpendicular gravitation, by its proper Motion or its own gravitation; yet the Air being one continued body, and ſo interwoven and as 'twere mortaiſed one part in another, the other parts of the Air, that are contiguous every where to the Earth, do ſuſtain and bear it up, like the ſides of an Arch, from all ſenſible preſſure or gravitation upon any determinat or particular body, that is within the compaſs of its preſſure. And although the Air be mingled with vapors of Terreſtrial and Aqueous *Effluvia*, heavier than it ſelf; yet they are, *ſaith he*, ſo interwoven in the very webb and texture of the Air, that it ſupports many of them; and thoſe that are too heavy for it, or much diſunited and ſeparate from it, are precipitated upon the ſuperficies of the Earth, and the Air diſcharged of them, as in Rain, Snow, Hail, &c. All which he attempts to make out by ſome Experiments; which whether they be unexplicable by the *Hypotheſis* contended againſt, we muſt leave to thoſe that are concern'd to Judge.

3. He ſets down, what it is *not* that may be ſuppoſed in the ſpace deſerted by the Mercury in the *Torricellian* Experiment, viz. that 'tis not *Nothing*, nor *Air*, nor *Æther*, nor any body, that comes from without.

4. He declares, what he thinks it is, that poſſeſſes the place derelict by the Quickſilver; namely, a *ſubtle Corporeal ſubſtance extracted from the groſs Mercurial body, or forced out of it*; not by *Linus* his way, which our Author takes to be this, that by the deſcent of the Mercury, and in *obſequium naturæ univerſalis*, or

orfor preventing of vacuity,there are taken away ſucceſſively from the ſuperficies of the Quickſilver certain ſcales as it were of an indiviſible profundity, rarified into a ſubtle inviſible conſiſtence,which ſupply that deſerted ſpace, and make up a kind of *funiculus*, that ſuſpends the Mercury to the Tube, and is coextended to the whole vacant ſpace gradually, as the Mercury deſcended. This way,*I ſay*,our Author rejects, alledging his reaſons for doing ſo; and ſubſtitutes certain *Effluvia* and ſubtle ſteams,ſent out from the Mercury; affirming, that theſe ſteams or vapors are ſeparated from that body,*firſt*, by way of *Expreſſion,* or ſtraining them out by the ſtrong deſcending motion of the Mercury,and the compreſſion of the inferior parts by the ſuperior, as alſo, the great agitation of its parts; the groſſer Mercurial parts coming cloſer together,and expelling the more ſubtle and vaporous parts.*Secondly*,by way of *Extraction*,or drawing out thoſe parts that are more ſubtle and fluid,and capable of expanſion; whence he thinks ariſeth that *lucta* and *mora* obſerved in the deſcent of the Mercury. And theſe parts thus extracted are, *in his opinion*,dilated to as great an amplitude and tenſion,as the ſtrength of the deſcent of the Mercury, and the wideneſs of the ſpace,it leaves,requireth; which tenſion alſo, *he ſaith*, contributes much to the retarding of the ſwiftneſs of the Mercurial deſcent.And becauſe at about 29½ inches the weight of the Quickſilver decreaſeth to ſuch a ſtate,as cannot work any further ſeparation of ſubtle matter to ſupply any more room,it ſtays there, and deſcends no farther, not having ſtrength enough at that height to ſeparate any ſubtle matter from it ſelf, to ſupply the ſpace it ſhould leave by ſuch deſcent. Where he conſiders,that,although the immediat cauſe of the ſeparation of the ſubtle matter of Mercury, and the expanſion thereof, be the force of the deſcent, weight and preſſure of the Mercury; yet this is performed to avoid the Diſſolution of Continuity, or (which is all one) a *vacuum.*

5. What is *not* the Cauſe that *ſuſpends* the Cylinder of Mercury in the Tube to the hight of about 29 inches; namely, not the Gravitation or Preſſure of the impending Air, nor its Elaſticity; Where our Author largely examins the doctrine of the

Spring of the *Air*,viz. 1.What Spring is of all hands agreed to be truly found in the Air. 2. What Spring is ſubſtituted by the late Philoſophy,and how by the Aſſertors thereof it is applied to the Solution of *phænomena* of this kind. 3.What his Reaſons and Evidences are to evince the miſtake,as *he eſteems* it,of this Elaterical ſuppoſition ; and how, in his opinion, ſome Arguments for the Weight and Spring of the Air may be anſwered.

6. What he thinks to *be* the Cauſe that *ſuſpends* the Mercury from ſubſiding below 29 inches or thereabout in the *Torricellian* Tube. Where he affirms,that the Cauſe, why the Mercury falls ſo low as 29½ inches,is,that the weight of the deſcending Mercurial column is of that ſtrength, as to give the included Air that tenſion or dilatation ; and, why it ſubſides no lower, is,becauſe,when the Air hath attain'd its utmoſt extenſion that the deſcent of that column of Mercury can give it, that Aerial Cylinder holds it there,and keeps it up to that height,the weight of the Mercury being now leſſen'd.Which he undertaketh both to make out by ſome obſervations,and to free from what may be objected againſt it ; to all which he adds inſtances, by him conceived fit to ſhew,that the Tenſion of the Air or any other tenſible body neceſſarily effects attraction on the bodies to which it is contiguous. Which done,he conſiders,how it comes to paſs,that,ſince there is yet remaining about 29½ inches of Mercury in the Tube,which doubtleſs hath a reſidue of ſubtle matter extractable out of it,to ſupply a greater room than what is yet left above 29½ inches, that, *I ſay*, by the weight of that 29½ inches of Mercury there is not more of the Mercurial effluxes extracted and dilated, which may give a total deſcent and an evacuation of all the Mercury in the Tube, into the ſtagnant Mercury in the ſubjacent veſſel.

7.He ſets down and endeavours to anſwer thoſe Objections, that ſeem to him of greateſt force againſt the ſuppoſition of the former paragraph.

8. He examins particularly and laſtly the coheſion of the Poliſh't Marbles,and the *Magdeburgh* Hemiſphere, and the raiſing of water in common Pumps.

So far of the contents of this Treatiſe: It not being the Intent of the Publiſher of theſe Papers to cenſure any Books, that are therein taken notice of; he only craves leave to ſay thus much of the Piece he hath now given an account of; That ſome very Learned and Able men, who have peruſed the ſame, though they acknowledge it to be very ingenious, and containing more ſpecious Objections and Experiments againſt the Maintainers of the Weight and Spring of the Air, than have been produced hitherto; yet they declare withall, that ſuch Objections ſeem not cogent to them, and that the Experiments alledged to the contrary, may be ſolved by the very *Hypotheſis* impugned by this Author. So that we ſhall leave it to fit Readers to Judge, whether there be not already ſaid enough by the Honourable *Robert Boyle* (to name here no others) in his *Phyſico-Mechanical Experiments*, both the *firſt Treatiſe*, and the *Continuation*, as alſo in his *Anſwer to Fr. Linus*, and, in his *New Experiments about the Preſſure and Spring of Air upon Bodies under water*; and likewiſe in his *Hydroſtatical Letter, dilucidating an Experiment of weighing water in water*, printed with the ſame new Experiments againſt Mr. *George Sinclair*? And whether thoſe real and viſible things, by which it appears, that ſuch a Cauſe being put, ſuch an Effect follows, and the ſame Cauſe being removed, the Effect alſo ceaſeth, be not indeed more ſatisfactory, than a *funiculus ex ſubtilibus Mercurialibus effluviis contextus,* faſtning the Mercury to the Tube as far as 'tis void thereof.

II. *A MATHEMATICAL COMPENDIUM, collected out of the Notes and Papers of Sir* Jonas Moore *by* Nicholas Stevenſon. London, 1674. *in* 12°.

THis well-ſtored Pocket-book contains abundance of Uſeful Practices in Arithmetick, Geometry, Aſtronomy, Geography, Navigation, Embatteling and Quartering of Armies, Fortification, Gunnery, Gauging and Dyalling; explaining alſo the Logarithmes with New Indices; *Nepairs* Rods; making of Movements, and the Application of Pendulums;

lums; with the Projection of the Sphere for an Univerſal Dyal, &c. To all which is premiſed; *firſt*, a *Diary* for the year 1674. containing the Deſcription of the year, Feſtivals and notable Days, Suns Riſing, Changes of the Moon, &c. with the time of High water at *London-Bridge*, with Rules to ſerve other places, calculated for each day from the *true Southing* of the *Moon*, and a *New Theory of the Tydes*, differing, ſome days, above an *Hour and half* from the Ordinary Rule, and computed by his Majeſties ſpecial command: *ſecondly*, a Perpetual Kalendar; and in it the Uſes of three ſmall Tables for finding the Days of the Month, Suns place, Right Aſcenſion, the Prime, Epact, Moon, Tydes, Stars, &c. for ever. *Thirdly*, a Table of Meaſures, Square or Superficial: Meaſure for Horſes: Agreement of Meaſures of other Countries with ours: A Table of Troy-weight, and that of Apothecaries and Aver-du-pois; together with the beſt proportion of Troy and Aver-du-pois; as alſo the manner of weighing all ſorts of Commodities; and of dry meaſures: A Table for Corn meaſure; and of the Chaldron and Water meaſure: Tables of wine-Beer-and Ale-meaſure: The value and fineneſs of Gold and Silver: A Table of the proportion and weights of Metals, Liquors, &c: A Table of the Aſſize of Bread for all weights.

Theſe particulars being premiſed, *Arithmetick* is firſt treated of, and, in it, Numeration, Addition and Subſtraction in Whole and Decimals; Multiplication and Diviſion, with or without *Nepair's* Rods, moſt eaſie and certain: Extraction of the Square and Cube Roots eaſily by the ſame Rods: The *Logarithms* and their Uſe: Further, of Reduction, and *Decimal* Tables, at large: Of Fractions: Of Progreſſions and Combinations: Of Proportion, direct and backward: Of the double Golden Rule, and continual Proportion: Ordinary Rules of Practice in Arithmetick: Rules for *Duodecimal* Arithmetick: Rules of Practice for Intereſt, ſimple or compound: Rules concerning Free-holds to be bought or ſold: A Table to purchaſe by, at 5, 6, 8, or 10, *per cent.* Of the Uſes of the Tables of Sines and Tangents.

In the *Geometrical* part is contained the Reſolution of Plain and Spherical Triangles; *Longimetry*, *Planimetry*, and *Stereometry*:

metry: In *Longimetry*, the Art of Levelling, the Meaſuring of Hights or Diſtances unapproachable, and the Hights of ſeveral Steeples, Towers, &c. in *Engliſh* feet; ſome Propoſitions Geometrical for ordinary uſes; a Table giving the length of the parts of a Circle. In *Planimetry*, the Meaſuring of Triangles with and without a Perpendicular; of Squares, Oblongs, Regular or Irregular figures; the dimenſion of Circles, and other Round figures; the beſt Proportions for Circles, Spheres, Cylinders, &c. Meaſuring of Pavements, Plaiſtering, Wainſcotting, &c. Meaſuring of Carpenters-and Brick-work: Tables, *to* caſt Square Feet into Perches of a brick and a half thick, &c. *to* turn Square inches into Sticks, and parts of Tapeſtry; *to* turn ſquare inches into feet, quarters and inches. In *Stereometry*, or meaſuring of Solids, as a tapering Timber, Spheres, Sectors and Segments of Spheres, Spheroids: Tables, *for* plain and ſolid meaſure; *for* turning ſolid inches into ſolid feet, and *for* finding a foot by the ſuperficial content at the end of Timber or Stone: The meaſuring of Earth-work, as Cellars, Vaults, Ramparts, &c. A Table to turn ſolid feet into floors, quarters, &c. Meaſuring Ships, Veſſels, &c. To double a Cube: By the magnitude or weight of any body, to know the weight of another body, *& contrà*: The weights of Metals, Stones, &c. in water: Two Tables for turning ſolid inches of water into *Aver-du-pois* weight, and contrarily: The meaſuring of all Irregular bodies by ſinking them in water: Of the *Gauging* of Veſſels: Tables for turning any number of ſolid inches into Wine-meaſure, or into Beer or Ale-meaſure, as alſo into dry meaſure: The meaſuring Veſſels not full.

After this do follow the Inſtructions for *Embatteling* of Souldiers, for *Caſtrametation*, *Fortification*, and *Gunnery*; concerning which laſt, there is a Table of the Names of Guns, their weight, bore, ſhot, powder for proof and ſervice; as alſo the Names of the Implements belonging to a Gun; to tertiate, to diſpart, and to know the bore; about the ſhooting in great Guns, with their ranges, and a Table of ranges.

As for *Aſtronomy*, here are deliver'd Problems for practice of plain and ſpherical Triangles, and Problems of the Sphere; and then, the obtaining of the Hour and Azimuth by taking the hight of the Sun.

Concerning *Geography*, he treats of Zones, Inhabitants, Climats, Maps, Lands, Seas; and gives exact rules to know the Diſtances and Poſitions of places, and likewiſe the way to know the Contents of any parcel of the Earth in ſquare Miles, contain'd in any Triangle.

Next, he teaches *Navigation* by the plain Sea-chart, by *Mercator*'s Chart, and by a great Circle; where is added a Table to turn the *Rumbs* into degrees and minutes; together with ſome Problems for knowing the Ships way on a great Circle, upon a Parallel, or upon any Rumb.

In the doctrine of *Dyalling*, he gives us the way of making an Horizontal or erect Dyal; then a Mechanical way for all Dyals, and very exact; the Deſcription and Uſe of an Univerſal Dyal, being a new Projection of the Sphere, together with the uſes thereof in very many Propoſitions, both for Hour and Azimuth, and the Stars: To which is added a Diſcourſe of the nature and fabrick of Watches, Clocks and other Movements, with directions for *Pendulums*; and how we are to find the number of beats, which a Movement makes in an hour or minut, turns of the Fuſy, and length of going: treating particularly of Pendulums, the Univerſal Meaſure, length of Pendulums, and the way of regulating the inequality of a Pendulum, and how to know, what alteration in time the lengthning or ſhortning of a Pendulum to a tenth of inches will make; moreover, of finding out fit numbers for the Wheels and Pinions. To which are ſubjoyn'd Examples for ſmall and greater Clock-and Watch-work; and a Rule of giving particular motions. Which is followed by a Note concerning *Time*, and the Length of the Solar and Sidereal days, and how to adjuſt the Pendulum; and then, *by* the Uſes of the Tables of the Suns right Aſcenſion: To which is added the mention of an 100 notable Stars; and of 22 Stars about the North-pole, concerning which latter ſtars, here never riſing or ſetting, there is an excellent and uſeful Table, which ſhews their Right Aſcenſions, and their Time and Azimuth, when they come under the *Pole-ſtar*: Whence, if you do but hang up a Thred & Plummet, and, looking through a hole to take away the ſtars ray, obſerve, when any of theſe 22 ſtars come with the Pole-ſtar to that Perpendicular; if you ſubſtract the Suns right

Aſcenſion from the Hour of the Stars coming under the North-pole, you have the true Time of the *Night* to a minute.

At the latter end of the Book is to be found, 1. the Table of Logarithms for all numbers under 10000; 2. the Table of Proportional parts; 3. the Table of Sines and Tangents to each degree and 10′; 4. a Table of the Prices of Commodities, from 1 to 10000 pounds, ells, yards, &c. 5. a Table comparing the Engliſh foot and pound with Forrain feet and pounds; 6. a Table for Gauging Casks not full; 7. a Table of Meridional miles and parts; 8. a Table of the Right Aſcenſion of the Sun; and 9. another of the Longitude and Latitude of 100 notable fixed ſtars, with their right Aſcenſions in degrees and time, and Declination for *A.* 1680; with the difference for every ten years, to ſupply them for ever.

III. *Icones & Deſcriptiones RARIORUM PLANTARUM Siciliæ, Melitæ, Galliæ, & Italiæ, Auth.* Paulo Boccone, *Panormitano Siculo*, &c. E Theatro Sheldoniano, 1674.

THis Induſtrious and Skilful Botaniſt, having ſpent many years and much labor in the ſearch after rare Plants through *Sicily*, *Italy*, and other Countries, thought fit to publiſh part of them here in *England*, where he was himſelf not long ſince, and very generouſly left his engraven Plates and Manuſcripts concerning the ſame, to be printed, as now they are, in the ſplendid *Sheldonian* Theater at *Oxford*. There are above an hundred Plants, repreſented in 45 Plates, and thoſe (a few ones excepted) not deſcribed elſewhere. Amongſt them is found a Fruit, in appearance an *Orenge*, but fill'd with a Citron-pulp; to be met with in the gardens at *Rhegium* and *Meſſina*. There is alſo deſcribed a certain *Fungus* of *Sicily*, with a blewiſh pulp, and a coriaceous ſhell, with the decoction of which latter, they at *Meſſina* dye wool and cloth of a purpliſh color. Notice alſo is taken of a *Kali Sculum*, having ſomtimes a root bigger than a mans thigh, and yielding aſhes exceeding uſeful to waſh and whiten linnen. Nor may we paſs by the *Fungus Typhoides coccineus* of *Maltha*, by reaſon of its celebrated aſtringency and vertue in ſtaunching of blood; nor the *Heliotropium* of *Sicily*, with a flower extraordinary both for bigneſs and ſweet ſcent, &c.

It is much wiſhed, that this Author, whoſe genius and abilities are conſiderable in the ſearch and ſtudy not only of Plants, but alſo of other Obſervables of Nature, may find ſuitable encouragement to continue his diligence for further diſcoveries of that kind.

IV. *NAVIGATION and COMMERCE, their Original and Progreſs: Containing a ſuccinct Accompt of Trafick in general; its Benefits and Improvements: Of Diſcoveries, Wars and Conflicts at Sea, from the Original of Navigation to this day; with ſpecial regard to the* ENGLISH *Nation: Their ſeveral Voyages and Expeditions unto the Beginning of our late differences with* Holland; *In which his Majeſties Title to the Dominion of the Sea is aſſerted againſt the Novel and late Pretenders*: *By* J. Evelyn *Eſquire, F.R.S. printed* 1674. in 8°.

ONly a part of this Title was named for an other purpoſe in the laſt Tract, *Num.* 103. *p.* 59. In this Elegant Diſcourſe, beſides the largeneſs of the Hiſtorical Collections, the Worthy Author excites *England*, and adviſeth the moſt advantagious Preparations for our future Defence, and for aggrandizing our Trade and Commerce: Which ought to be our Care, whilſt we have the opportunity, and whilſt we are leſs-concern'd Spectators of the Wars round about us.

Note. The miſtake in *Num.* 103. *p.* 57. *l.* 17. in the Anſwer of *Janus*, gives us the opportunity of inculcating a ſtronger impreſſion by the amendment, thus; JANUS *being asked, Why, when we ſacrifice to other Gods, the Frankincenſe and Wine muſt be firſt offer'd to his Godhead*;

Ut poſſis aditum per me, qui limina ſervo,
Ad quoſcunque voles, inquit, habere Deos.

Then to the Queſtion, Why cheerful and good words muſt celebrate his Calends;

Omnia principiis, inquit, ineſſe ſolent.

Cheerful beginnings of the particulars there mentioned, viz. *Nurſeries* of *MULBERIES* and *VINEYARDS*, would raiſe our hopes to ſee *England* in few years well improved, according to the Religious or Myſterious Obſervations of the Old Greeks, and no leſs proſperous Romans.

Errata left uncorrected in Numb. 103.

Pag. 51. l. 37. r. *indicate* for *indeare*. p. 52. l. 27. r. *I know not*. p. 57. l. 7. r. *return from*. ibid. l. 27. r. *waters of*.

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society*, 1674.

BRITISH MUSEUM NATURAL HISTORY

Tab. 1. N° 105.

Fig. 1.

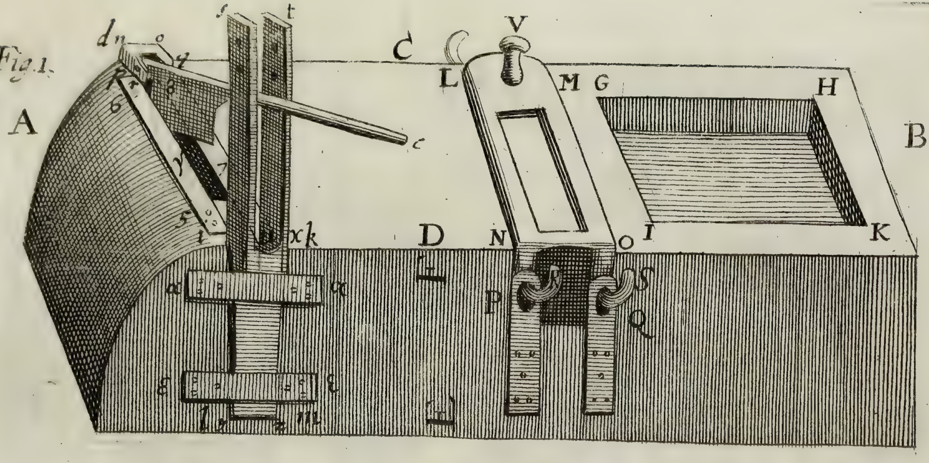


Fig. 2.

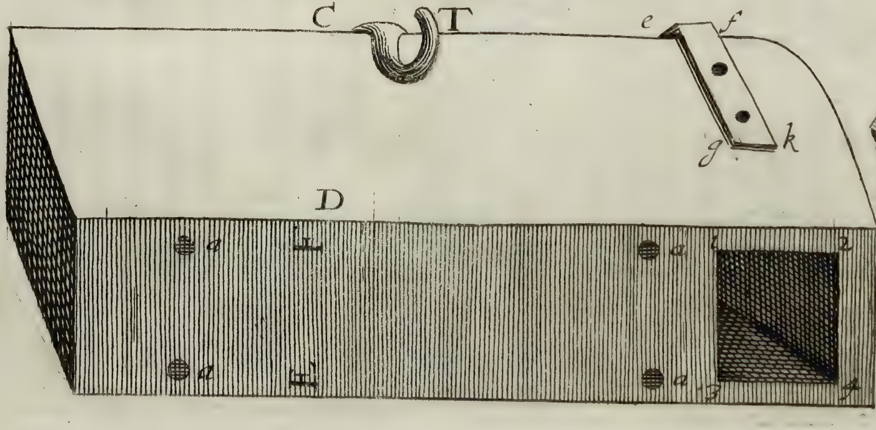
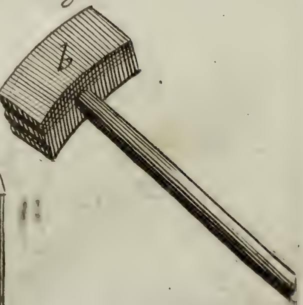


Fig. 3.



Numb. 105.

PHILOSOPHICAL TRANSACTIONS.

July 20. 1674.

The CONTENTS.

Extracts of two Letters, the one from Monſieur Chriſtian Hugens de Zulichem, *touching his Thoughts of Mr.* Hooks *Obſervations for proving the* Motion of the Earth; *the other from Signor* Caſſini, *concerning the ſame Argument. Brief Directions how to prepare and* Tan *Leather, according to the new Invention of the Honourable* Charles Howard *of* Norfolk, *experimented and approved of by divers of the principal Maſters of that Trade; together with a Deſcription of the Engin, for beating and cutting the Materials of Tanning. An Extract of a Letter from Mr.*Liſter *about* Snails, *together with ſome* Quære's *relating to thoſe Inſects, and the Tables themſelves, enumerating the various Land and Freſh-water Snails. A Relation concerning Women of* 60 *and* 66 *years of age, giving ſuck to little Children. An Accompt of two Books: I. Tractatus quinque Phyſico-Medici, de* ***SALE-NITRO*** *&* ***SPIRITU NITRO-AEREO***, *de* ***RESPIRATIONE***, *de* ***RESPIRATIONE FÆTUS*** *in* ***UTERO*** *&* ***OVO***, *de* ***MOTU MUSCULARI*** *&* ***SPIRITIBUS ANIMALIBUS***; *& de* ***RACHITIDE***: *Auth.* Joh. Mayow *L.L.D. & Medici, &c.* II. ***ANATOME CORPORIS HUMANI***, *conſcripta ab* Iſbrando de Diemerbroeck, *Med. & Anat. Profeſſore.*

An Extract of Monſieur Chriſtian Hugens de Zulichem *his Letter to the Publiſher, of the* 15th. *of* May 1674. *from* Paris, *touching his thoughts of Mr.* Hook's *Obſervations for proving the Motion of the Earth, not long ſince printed by Mr.*Martyn, *and taken notice of in* Numb. 101. *of theſe Tracts.*

—— THe Obſervations of Mr.*Hook* for finding out the Motion of the Earth are very good, and of great conſequence; but they muſt be continued, to ſee, whether in the courſe of one or more years the *Parallaxes* do regularly anſwer to the Annual Motion of the Earth. To which we alſo ſhall contribute our labors; and the Vault, that is in our Obſervatory, being 28 fathom deep, will in time be very uſeful for that purpoſe. This, if it ſucceed, will prove an almoſt entire conviction of the *Anti-Copernicans*, ſince there will remain for them nothing but this un-grounded ſubterfuge, to ſay, that the Center of the Sphere of the Fix't Stars continually changes its place for an Annual Motion.

An Extract of another Letter, written by Signor *Caſſini* to the Publiſher, relating to the ſame ſubject, dated *June* 28. 1674: Which we ſhall inſert here in the ſame language, 'twas written in.

—— *NOn poterat, meo judicio,* D. Hookius *aptiori methodo Parallaxes Orbis annui in Fixis inveſtigare, nec aptiorem ad eam inveſtigationem eligere Stellam, quæ ex lucidioribus & vertici proxima eſſet, & à polo Zodiaci non remota. Nec inutilis fuit viri doctiſſimi conatus, cùm diverſitatem invenerit ad eam partem, ad quam exigit Parallaxis.*

Noſtræ equidem Obſervationes nihil adhuc adeò liquidum hoc in genere exhibuêre, licèt in Fixarum Altitudinibus meridianis, variis anni temporibus, deprehenderemus differentias alias ab iis, quæ ad promotionem Fixarum ex Æquinoctiorum præceſſione conſequuntur. Nondum tamen, quas ad hanc rem præmeditati ſumus Obſervationes, exequi potuimus.

Puteum habemus in Obſervatorio ad id paratum, per fornicum foramina cœlo pervium, altitudinis à fundo, quò ſcala commodè ducit, pedum fermè ducentorum, ſed operibus fabrorum ſupremum fornicem fulcientibus, adhuc impeditum. Itaque nihil nobis per eum hactenus tentare licuit. Gratias interim Tibi ago maximas, Vir Clariſſime, pro communicatis D. Hookii *Obſervationibus, quæ nobis majori erunt incitamento ad correſpondentes inſtituendas. Vale, & me ama.*

Obſervations concerning the Comet *that was ſeen in* Braſil *A.* 1668. *in* March *by P.* Valentin Eſtancel *a Jeſuite, and by him ſent to* Rome; *where they were printed in the* 9th *Italian* Giornale de Letterati, *Septemb.* 31. 1673.

This being the ſame Comet with that, taken notice of in *Numb.*35. of theſe Tracts, and our account, then given of the ſame, being likely to receive ſome advantage and light from theſe Obſervations, made in *Braſil*, and but lately come to our hands, we thought it wou'd not be un-acceptable to the Curious in *England*, to ſee them Engliſh't out of the *Italian*, and here inſerted. They are as followeth;

There hath not been a *Phænomenon* this great whi'e, of which, as of this, I am now going to deſcribe, we have had Obſervations from all parts of the World. Thoſe from *Europe* and *Aſia* may be ſeen in our 3*d* and 4*th. Giornale.* Now I have received thoſe of *America*, made in the City of *St. Salvador*, in the Southern Latitude of 12 *deg.* 47 *min.* Likewiſe the Jeſuite P. *Pietro Suſarte*, Rector of *Macao*, in the Eaſt-Indies, well vers'd in matters Aſtronomical, writes to have ſeen the ſame all along the coaſt of *Bona Speranza*, though he communicates no particular Obſervations, becauſe he wanted Inſtruments to make accurate ones, and to ſee the *Head* of this Comet.

To come then to the *Braſilian* Obſervations, it hapned, that on the 5*th* of *March* 1668. (*ſt. n.*) at 7 a Clock at night, the Sun being then in *Piſcis*, Father *Eſtancel* began to ſee this Comet a little above the Horizon from Weſt to Eaſt-South-Eaſt. That which ſomewhat ſurpriſed him was, that at the very beginning it appear'd in its greateſt bulk, and with extraordinary brightneſs, which is not uſual in Comets, they being wont firſt to appear ſmall, and by little and little greater. The beginning of its Tayl was a little under the two lucid Stars, the 15*th* and 16*th*. of the *Whales* back, over which it then paſs'd, its point being as 'twere at the 8*th* and 9*th*, which are in the bottom of the *Whale*'s belly; and thus the whole length thereof was of about 23. degrees. The Globe or Head of it was ſo ſmall and thin, that very few could diſcern it with the naked eye; and the Father needed a Teleſcope to ſee it well.

The 6*th* of *March* it was cover'd with clouds; and the 7*th*. of the ſame, the former brightneſs was ſomewhat leſs, and become ſo thin, that the Eye could eaſily ſee the Stars that were behind it, which, by conjecture, were the 14*th* and 20*th*.

The 8*th*, there were diſcover'd more fixt Stars behind the Chevelure; from the 8*th*, 10*th* and 11*th* day, until it came to the little *Hare* and to *Eridanus*, certain ſmall Stars, being in that Celeſtial River, did likewiſe ſhine forth through it.

The Tayl was always directly oppoſite to the Sun; and when it appear'd the firſt time, almoſt Horizontal, it was ſeen in the form of a Pillar, the Head ſtanding a little under and on the ſide of the Star of the *Whale*, which is in the Latit. of 15 *deg.* 46 *min.* and in the Longit. of the 12 *d.* 42 *min.* of *Aries*. And the point did ſhave the 14*th*, North of the three that are in the Belly, in the Latit. of 20 *d.* 30 *m.* and the Long. of 15 *d.* 57 *m.* of *Aries*.

As to the *Colour* of this Comet, it was at firſt very ſplendid, and caſt it ſelf with that vividneſs upon the Sea, that the Rays thereof were reverberated unto the ſhore, where the Obſervers ſtood. But this brightneſs laſted only for three days, after which it did conſiderably decay. But that which ſeem'd ſomewhat ſtrange, was, that having loſt ſo much of its light, yet its bulk was not diminiſht but continued rather increaſing until the Comet diſ-appeared.

The *P. Eſtanzel* ſaith, he could not eſtabliſh any thing certain touching the true Magnitude of this Comet, becauſe it laſted but a little time, and ſtood alwaies near the Horizon. Mean time he obſerved, that it paſſed more ſwiftly than *Venus*, which poſſibly, at the beginning of this *Phænomenon*, might have paſt the tenth degree of *Aries*. Whence he infers, that it was *under* Venus; yet the anticipation was not ſo great, that it could be believed to be *under* the *Moon*, as he would have it; adding, that it could not be ſeen by all the Inhabitants of the Southern Hemiſphere, nor of the Europeans unto the 78. deg. of the Northern Pole, to whom it was Horizontal, and therefore hardly viſible by reaſon of the vapors of the Atmoſphere.

It may be taken notice of, that a Moneth before, upon a report that a Comet had been ſeen towards the morning in the Horizon of the riſing Sun, and certain *Carmelites*, that live upon a hillock of the ſaid Town, having affirmed, that they had obſerved it ſeveral times; our *P. Eſtanzel* began to doubt, whether the Comet, he ſaw, were not the ſame, which, more ſwift than the Sun, according to the ſucceſſion of the *Signs* might within that time have got clear of the Solar Rays; and his ſuſpicion grew the ſtronger, becauſe the Head was then turned towards the Sun, and the Tayl towards the Weſt, oppoſite to the ſame.

It may alſo be noted, that at St. *Salvador* this Comet appear'd not ſo long, as at *Rome* and at *Goa*; but then, the Head thereof was ſeen in *Braſil*, which was not poſſible to be ſeen elſewhere.

Brief Directions how to Tan Leather *according to the New Invention of the Honourable* Charles Howard *of Norfolk, experimented and approved of by divers of the principal Tanners uſing* Leaden-hall *market.*

EVery part of the Oak-tree, of what age or growth ſoever, and all Oaken Copice-wood, of any age or ſize, being cut and procured in Barking time, will tan all ſorts of Leather as well, at leaſt, as Bark alone.

This material being gotten in its proper ſeaſon, it muſt be very well dried in the Sun, and more than Bark; then houſed dry, and kept dry for uſe; and when it is to be uſed, the greater wood may be ſhaved ſmall, or cleft fit for the Engin, by and by to be deſcribed; and the ſmaller to be bruiſed and cut ſmall by the ſame Engin: Which done, it muſt again be dried very well upon a kiln, and then ground, as Tanners uſually do their Bark.

Such wood as is to be uſed preſently after 'tis gotten, will require the better and more drying upon the kiln; otherwiſe it will blacken and ſpoil all the Leather.

Where Oak is ſcarce, *Thorns* may indifferently well ſupply that ſcarcity.

Birch ordered and uſed inſtead of Oak, is very fit for *Soal-leather.*

As theſe Ingredients will Tan better than Bark alone, and that with far leſs charge; ſo may this Invention ſave the felling of Timber when the Sap is up; which, when 'tis done, cauſes the outſide of the Trees to rot and grow worm-eaten; whereas, if the Trees had been felled in winter, when the Sap was down, they would have been almoſt all Heart (as they call it,) and not ſo ſubject to worms. Beſides that this Invention will greatly improve the value of Under-woods.

The Deſcription of the Engin above-mentioned, for Beating and Cutting the Materials of Tanning.

THis Engin in *Tab.* 1. *fig.* 1. and 2. conſiſts of a long ſquare woodden Block, and of ſome pieces of Iron, to be faſtned on it and uſed about it, *viz.* an Anvil, a Hammer, an Iron holding the wood to be bruiſed and cut, and a knife to cut the ſame.

Oak or Elm is accounted beſt for the ſaid Block, the Dimenſions whereof are theſe;

A B, in fig. 1. the Length of the Block, about 4 foot.
C D, the Breadth thereof 15 or 16 inches.
E F, the Depth, 8 or 10 inches.

The Iron pieces are;

G H I K, in fig. 1. a ſquare cavity to receive a plate of Iron, ſerving for an Anvil, to beat and bruiſe the Tanning ſtuff upon; which Anvil is to be about 4 inches deep, 9 inches broad, and 12 inches long.

L M N O, in fig. 1. the Iron for claſping and holding faſt the materials to be bruiſed and cut; which Iron muſt lye croſs the Engine about the middle of the ſaid piece of Timber; and it may be about 3 inches broad. It hath two hooks at *one* end thereof, *P Q*, which are turn'd upwards, and muſt be hookt into the loopes of the two hinges that are let in and faſtn'd to the ſide of the Engin, *R, S*, in ſuch manner that this claſping piece may have liberty to be a little raiſed for putting the Tanning ſtuff under it. At the *other* ſide, *T*, in fig. 2. is a ſingle hook, likewiſe turn'd upward, to hang a weight upon whilſt the ſtuff is bruiſing upon the Anvil, or cutting by the knife. The button in Fig. 1. ſerves to take up this piece by: *a a a a*, on the other ſide of the Block in Fig. 2. are the places for the 4 feet to ſet this Engin upon, which are to be of a convenient height to work upon it, *b*: the Hammer, in Fig. 3. for beating and bruiſing the ſtuff; which may be of 6 l. weight, and have the head about 3 inches ſquare, to work with both hands; but to work with one hand, or for a youth to uſe, let it be of about 3 l. weight, and the head about two inches ſquare The ſurface of one end of theſe Hammers is beſt to be ſmooth; but that of the other, dented, the better to enter into the ſtuff for quicker diſpatch. They are to be well ſteeled at both ends. The handles of theſe Hammers may be about a foot long; the bigger ought to be ſomewhat longer.

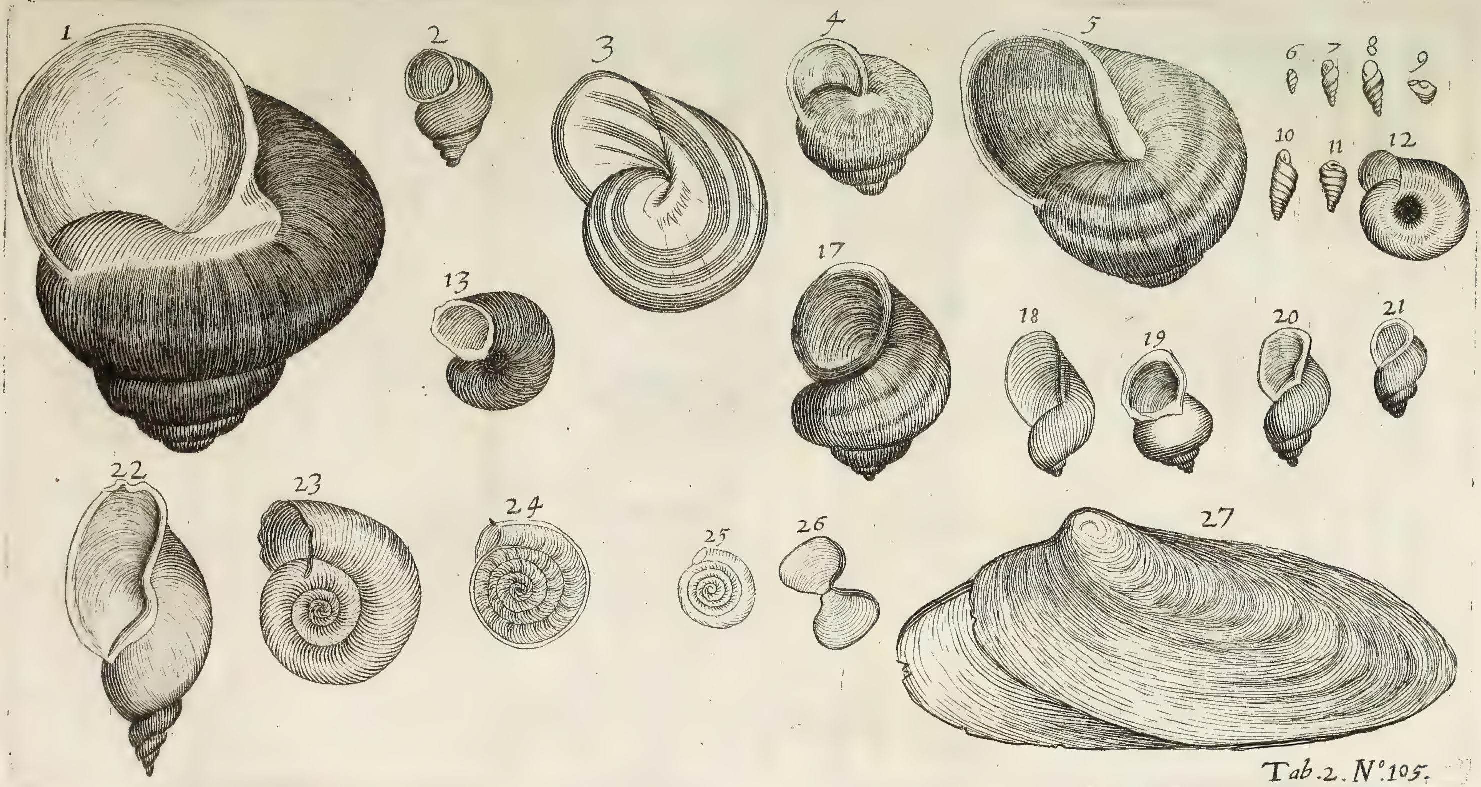
c. d. The Knife in Fig. 1. to cut the bruiſed ſtuff; which muſt be broad 8 or 9 inches, and neer as much in depth, made like a Tobacco-knife, with a handle to work. This Knife muſt be faſtned to the block at the two oppoſite ſides, that are to be hollow'd by two grooves, *e f g h.* in Fig. 2. and *i k l m* in Fig. 1; and this faſtning is to be performed by two pieces of Iron, to be fitted in the ſaid grooves, to hold and guide the knife in working; the *one* piece, *n o p q* in Fig. 1. is to be faſtn'd to the end of the knife *c* by a pin *r*, paſſing thorow 3 holes, and this end is to be ſcrew'd into the groove *e f g k* in Fig. 2. by a couple of ſcrew-pins; the *other* piece, *ſ t u x y z* in Fig. 1, being forked, is to receive the other end of the knife *d*; and the ſolid ſquare part thereof, ***i k l m***, is to be faſtn'd in the groove that is under it, by two Iron-plates α α, ε ε, under which it muſt run in the ſaid groove, ſo as that it may be ſlipp'd out from under it, and laid by, when the Engin is not uſed; at which time alſo the piece at the other end may be unſcrew'd and laid up.

The two long ſquares upon one end of the Block, in Fig. 1. *viz.* 5. 6. 7. 8. are two Iron-plates to be faſtn'd, where the knife, moving in a fit cavity, is to cut the bruiſed ſtuff between them. And of theſe plates that, which lyes next the end, is to be laid a little lower, the block being there pared accordingly, that ſo the ſtuff may fall off from the end of the Engin the quicker, as your left hand furniſhes the knife with the bruiſed materials, whilſt the right hand is cutting them.

Let the hollow place, where the knife cuts, be, as near as may be, ſo big only, that the knife may eaſily fall and riſe; and let the Block be hollow'd under the cutting hole, and ſloped off at that end, for the ſtuff to fall off as the knife cuts it.

An Extract of a Letter of Mr. Martin Liſter *concerning the firſt part of his* Tables *of* Snails, *together with ſome* Quære's *relating to thoſe Inſects, and the Tables themſelves; ſent to the Publiſher from* York *March* 12. 1673.

I Herewith ſend you the *firſt* part of our *Tables* of *Snails*, and ſome *Quære's* upon that ſubject; alſo the lively figure of each Shell for illuſtration, done by Mr. *Lodge*. I reſerve by me the *Sea-ſhells* and *Rock-ſtones*. That part, I ſend you at preſent, being at a ſtand with me, thoſe other increaſe upon my hands daily; which though *that* be not a ſign of perfection (for there is undoubted work for many ages,) yet it is of good advancement and progreſs; *this* other of the copiouſneſs of the ſubject. Again, in that part of the Tables, you have from me, Authors are very little concern'd; in the other of *Sea-ſhells* and *Stone-like Shells* there are many authors, which are to be conſulted and taken in, if poſſibly we can underſtand them treating of the ſame ſpecies. As for *Rock-ſhells* in particular, they come in to me in greater numbers, than I could ever have imagined. And I can aſſure



Tab.2. N°.105.

BRITISH MUSEUM NATURAL HISTORY.

ſure you, that of near 30 *Species*, I have now by me, found in this County alone, not any one can be ſampled by any *Sea*, *Freſh-water* or *Land*-Snail, that I have, or ever ſaw. So that you ſee, I have ſtill good reaſon to doubt of their Original, beſides many other arguments that my Obſervations about *Foſſils* do afford, and which you may poſſibly one day ſee. And that there are the elegant repreſentations of even *Bivalve-ſhells*, which never ow'd their original to any Animal, I can demonſtrate; and think none, that hath conſidered the thing with me, yet hath denyed: Of which hereafter. But whether al be ſo or no, I chooſe this method, as the moſt convincing, *viz.* to give a Comparative view.

Some general Quære's concerning Land and Freſh-water Snails.

1. Whether there are other Shell-ſnails at land, than Turbinate?

2. Whether this kind of Inſect are truly *Androgyna*, and equally participate of both Sexes, as Mr. *Ray* firſt obſerv'd; and whether both of them two, which ſhall be found in the act of Venery, do accordingly *ſpawn*, or lay thoſe perfectly round and clear Eggs, ſo frequently to be met with in the ſurface of the Earth and in the Water too; and the circumſtances of thoſe Eggs hatching?

3. Whether the way of fatting Snails, in uſe amongſt the *Romans*, that is, to make little paved places incircled with water, be not alſo very expedient in order to the true noting the manner of their Generation?

4. What light the *Anatomy* of this Kind of Inſect may give to the reſt?

5. Whether the black ſpots, obſervable in the horns of ſome Snails, are Eyes, as ſome Authors affirm, and not rather parts equivalent to the *antennæ* of other Inſects; as the flat and exceeding thin ſhape, alſo the branched horns, in other Species of Snails ſeem to confirm?

6. Whether the *coccinea Sanies*, which ſome of our Water-ſnails freely and plentifully yield, be not a *Saliva* rather than

an *extravaſated blood*: The like may be thought of the Juyce of the *Purple-fiſh*, now out of uſe, ſince the great plenty of *Cochineil?*

7. In what ſort of Snails are the *Stones*, mentioned by the Antients, to be found? And whether they are not to be found (in ſuch as yield them) at certain times of the year? And whether they are a cure for a Quartan; or what other real vertues they have?

8. What medicinal vertues Snails may have, as reſtorative to Hectic perſons; and what credit the *Romans* may deſerve, counting them, eſpecially the necks of them, highly venereal; *Celſus* alſo particularly commending them to be *boni ſucci*, and *ſtomacho aptas.*

9. Alſo inquire concerning the Mechanical uſes of the *Saliva* of theſe animals, as in dying, whitening of wax, hair, *&c.*

Note, that the Figures are numbered and explain'd by the *Tables.* The Figures of the *naked Snails* are omitted in this Specimen, being not material to that part of the deſign, which is, (when the other parts of theſe Tables are finiſh't,) to give the Reader an exact view of *Animal-ſhells*, as well as of *Foſſils* figured like Shells, whereby he will be beſt able to Judge, what to think of their Original.

Tabulæ

Tabulæ Cochlearum Angliæ, tum Terreſtrium Fluviatiliumque, tùm Marinarum, quibus accedunt Lapides ad Cochlearum ſimilitudinem figurati. *Vid. Tab.* II.

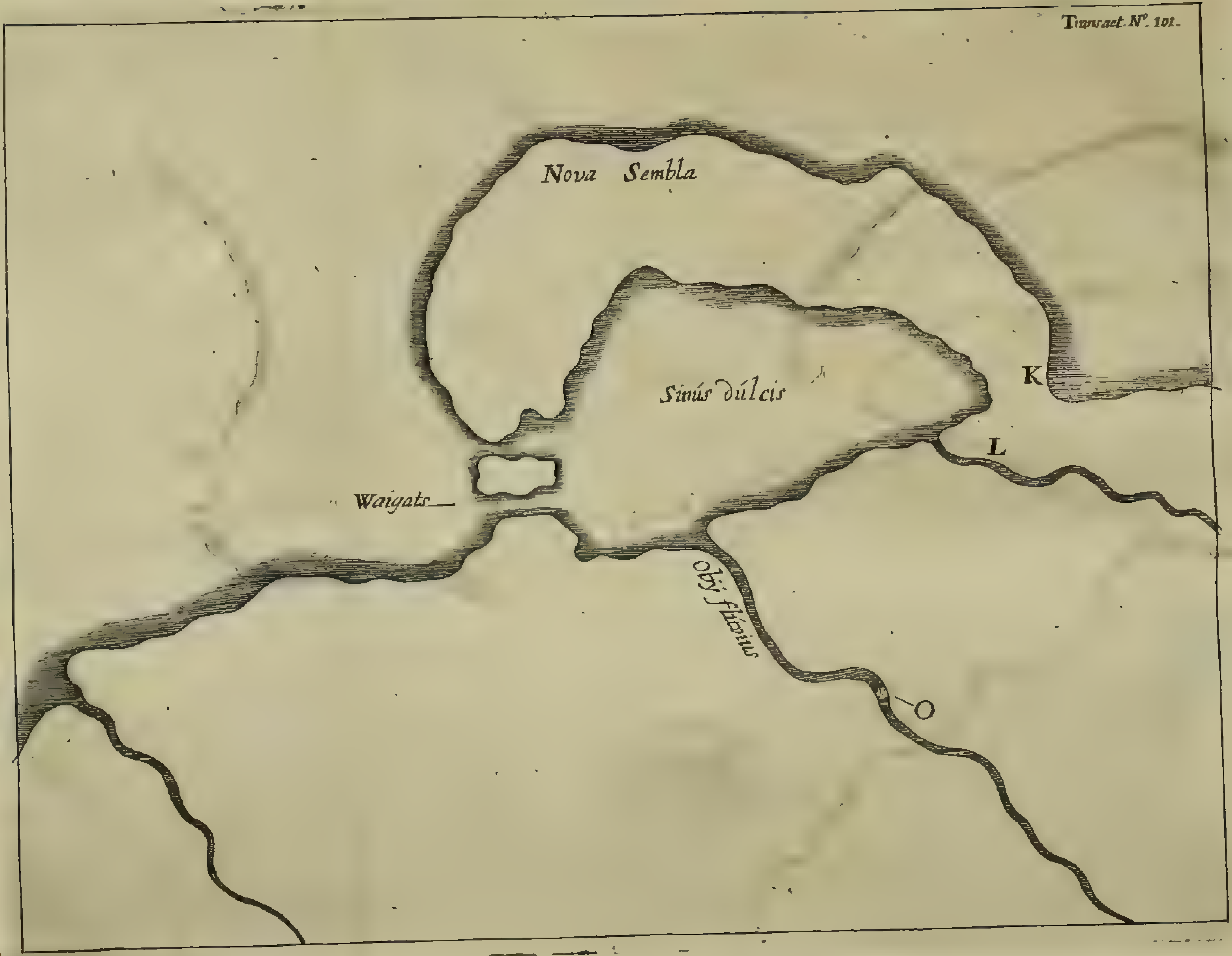
- *Cochleæ*
  - Terreſtres
    - *teſtis intectæ*
      - *Turbinatæ*
        - *breviore figurâ, Numero* V.
          - 1. *Cochlea cinerea maxima edulis, cujus Os operculo gypſeo per hyemem tegitur, agri Hartfordienſis.*
          - 2. *Cochlea cinereo levitèr rufeſcens, ſtriata, operculo teſtaceo cochleato donata.*
          - 3. *Cochlea & colore & faſciis multa varietate ludens.*
          - 4. *Cochlea ſubflava, maculata, atque unica faſcia caſtanei coloris per medium anfractûs inſignita.*
          - 5. *Cochlea vulgaris major, hortenſis, maculata & faſciata.*
        - *longiore figurâ*
          - *ad ſiniſtram convolutæ.* N. IV.
            - 6. *Buccinum exiguum ſubflavum, mucrone obtuſo, ſive figurâ cylindricâ.*
            - 7. *Buccinum alterum exiguum in Muſco degens,* 5 anfractuum, *mucrone acuto.*
            - 8. *Buccinum rupium majuſculum,* ſenis orbibus *protractum.*
            - 9. *Buccinum parvum ſive Trochilus ſylvaticus agri Lincolnienſis.*
          - *ad dextram, N.* II.
            - 10. *Buccinum pullum, ore compreſſo, circitèr denis ſpiris faſtigiatum.*
            - 11. *Buccinum alterum pellucidum, ſubflavum, intra ſenos ferè orbes mucronatum.*
        - *compreſſæ N.* II.
          - 12. *Cochlea cinerea, faſciata, Ericetorum.*
          - 13. *Cochlea altera, pulla, ſylvatica, ſpiris in aciem depreſſis.*
    - *nudæ,* limaces *dictæ quibuſdam. N.* III.
      - 14. *Limax cinereus maximus, ſtriatus & maculatus, lapillo ſive oſſiculo inſigni, loco Cranii, donatus, locis udis & umbroſis degens.*
      - 15. *Limax cinereus alter, parvus, unicolor, pratenſis.*
      - 16. *Limax ater.*
  - Fluviatiles
    - *Turbinatæ*
      - *Cochleæ N.* I.
        - 17. *Cochlea faſciata, ore ad amuſſim rotundo.*
      - *Buccina, N.* V.
        - 18. *Buccinum flavum, pellucidum, intra tres ſpiras terminatum.*
        - 19. *Buccinum alterum majus, paulo obſcurius, pellucidum tamen, 4 Spirarum, mucrone acutiſſimo.*
        - 20. *Buccinum fuſcum, 5 Spirarum plenarum, mucrone ſæpiùs mutilato, obtuſoque.*
        - 21. *Buccinum ſubflavum alterum, 5 Spirarum, atque operculo tenui & pellucido, teſtaceo tamen cochleatoque donatum.*
        - 22. *Buccinum longum ſex ſpirarum, in tenue acumen ex ampliſſimâ baſi mucronatum.*
      - *Compreſſâ teſtâ, Coccum fundentes N.* III.
        - 23. *Cochlea pulla, ex utraque parte circa umbilicum cava.*
        - 24. *Cochlea altera parte plana, & limbo donata, 4 circumvolutionum.*
        - 25. *Cochlea minor, alterâ parte plana, ſine limbo, 5 circumvolutionum.*
    - *Bivalvæ N.* II.
      - 26. *Muſculus, parvus, ſubflavus, teſtâ pellucidâ, piſi magnitudine, paluſtris.*
      - 27. *Muſculus alter, fluminum maximus, ſubviridis.*
  - Marinæ, *&c.*

A Relation written to the Publiſher from a perſon of great veracity in Germany, *concerning an aged woman of 60 years, giving ſuck to her Grand-child*; &c.

I Cannot but impart unto you ſomething lately hapn'd in my family, which is, That, having taken two months ago a Nurſe for my little girl, (ſince dead;) the boy of that Nurſe, having been on that occaſion weaned, did, by repeated ſucking the breaſts of his grand-mother, a woman of three ſcore years of age, cauſe ſuch a commotion in her, that abundance of milk run to her breaſts for a ſufficient nouriſhment to the ſaid weaned boy, whom alſo my nurſe, his mother, after ſhe return'd home upon the death of my girl, now again gives ſuck to, though her breaſts had been for ſome weeks dryed up.

So far this relation: Which as it can be confirmed by many other like Stories, given by very credible perſons, ſo I ſhall here ſecond it but with one only, recorded by the Learned *Diemerbroeck* in the ſecond Book of his *Anatome corporis humani cap.* 2. *pag.* 408. (of which Book an account is given at the end of this very Tract.) The relation is as follows: At *Viana*, a town very near us, ſome years ago, a poor woman, living before the town-gate, and being brought to bed of a fine boy not long after the death of her husband, and dying preſently after her delivery, left her child behind her in good health; but leaving nothing to keep a Nurſe to give the child ſuck, the grand-mother of the babe, called *Joanna Vuyltuyt*, being yet living, a woman of *three ſcore and ſix* years of age, but very poor alſo and not able to pay a Nurſe, out of great pity to the poor child, attempted, though at that age, to give it ſuck her ſelf; in which undertaking ſhe ſucceeded ſo well, that having out of her great commiſeration put her crying grand-child ſeveral times to her breaſts to ſuck, theſe breaſts did, from that old woman's ſtrong imagination and vehement deſire to give ſuck to this child, begin to yield milk, and continued ſo to do with that plenty, that it was ſufficient to feed the child, ſo that it hardly needed any other food; which all that ſaw it much wondred at, and which can be atteſted by many veracious citizens of the ſaid town.

Transact. N°. 101.



SEUM
S
ORY.

As this Author alledges this Example to fortifie his opinion concerning the Cauſe that impells the Chyle to the Breaſts, which he takes to be the Mother's or Nurſe's ſtrong imagination and paſſion to give ſuck ; ſo he adds an other, for the ſame purpoſe, known to himſelf, and hapned in his own family, which is ; That a little boy of his having been ſuckled for a while by his own mother, the Author's wife ; but being fallen very ſick, and for great weakneſs unable to ſuck any more for ſix or ſeven weeks, and conſequently given over for dead; the mother, having caſt off all hopes of giving it any further ſuck, let her milk dry up. But the child by great care recovering ſo far as to be able to ſuck again, and being put to an hired nurſe, after the mothers breaſts were dryed up, and this nurſe not uſing the child well, the Mother out of great compaſſion to her child, did, about the end of the ninth month from the time of her being brought to bed, take the babe to her ſelf again, and, whilſt an other nurſe was look'd for, with a thouſand embraces ſhe paſſionately wiſh'd and deſired, ſhe might have a full breaſt to give ſuck again her ſelf. A Nurſe being found the ſame day, and the child put to her breaſts, the wife of our Author found at night, from her ſtrong imagination and paſſion (*ſaith he,*) that her breaſts, though not ſtroaked by her, nor ſucked by the child, ſwell'd again, after they had for eight whole moneths been quite dryed up, and they yielded ſo much good milk, that, if the new nurſe had not been hired, ſhe could have given plentiful ſuck to the boy her ſelf.

An Accompt of two Books.

I. *Tractatus quinque Phyſico-Medici, de* SALE-NITRO *&* SPIRITU NITRO-AEREO; *de* RESPIRATIONE; *de* RESPIRATIONE FŒTUS *in* UTERO *&* OVO; *de* MOTU MUSCULARI *&* SPIRITIBUS ANIMALIBUS; *de* RACHITIDE: *Auth.* Joh. Mayow LL. D. *& Medici, &c.* Oxonii, *è Theat.* Sheldoniano 1674, *in* 8°.

THE *firſt* Treatiſe of this Book handling of *Niter* and the *Nitro-äereal* Spirit, premiſeth a *Hiſtory* of *Niter*, and concerning it teaches; What are its component parts; How 'tis produced in the Earth; What the Air contributes to its generation, and what the *Earth* it ſelf: Which laſt he eſteems to be made up of a Fixt Salt and Sulphur cloſely combin'd, and to contain the *Seeds* of Fixt Salts, even when elixiviated; which Seeds, *he ſaith*, are by an Aerial influx and ferment in tract of time digeſted and matur'd into a Fixt Salt.

Having deliver'd the conſtitutive Principles of Niter in general, the Author treats in particular of the *Acid Spirit* of Niter, affirming it to be produced partly by the Air, and partly by a Terreſtrial matter. Where he refers the Reader to thoſe *Boylean* Experiments [*], which make it out, that the Air furniſh's ſomething that is neceſſary to make a Flame: Which done, he teaches, that in *Niter* there do reſide *Igneous particles* of the Air, which conſtitute its moſt active part, and by which the flame of kindled Niter is produced, without any Sulphur, which ſubſtance he will not at all admit to be found in pure Niter, being of opinion, that the deflagration of Niter is made, not by any Sulphureous parts of its own, (of which he ſaith it has none,) but by thoſe Fiery Aerial parts, put into a very quick motion. Concluding upon the whole matter, that the *Aerial* parts of Niter are nothing elſe but the *Igneo aerial* particles thereof, requiſit to make Flame, and that this Aerial part of Niter is lodged in the *Acid* [*] *Spirit* of the ſame, and not in the Fixed Salt; which Acid Spirit, in his opinion, is compounded of a *Terren* matter, that is flexil and humid, and of *Ethereal* corpuſcles, that are rigid, dry, active and igneous, proceeeding from the Air. And theſe Igneous particles, conceived by him to be *common* to *Niter* and *Air*, he calls *Nitro aerial*, from whence the *Spirit of Niter* derives its cauſtique and corroſive nature, which he calls a *Potential* fire, and from whence he thinks alſo that the *Form* of *Fire* chiefly, if not only, depends. Now, foraſmuch as this *Nitro-aerial* igneous

[*] *See Mr.* Boyle's *excellent Tracts, printed A.* 1672. *in* London; *the firſt of which contains* New Experiments touching the Relation between Flame and Air, and about Exploſions; *where, among many other things, is evinced the Efficacy of the Air in the production of Flame even without any actually flaming or burning body: and where alſo the Curious Reader will meet with a full and very inſtructive account of thoſe Experiments, which this Author here glances at.*

[*] Compare *Experimenta & Meditationes circa Naturalium rerum principia Davidis von der Becke*, deſcribed *N.* 103. of theſe Tracts, *p.* 61.

Spirit reſides in the *Acid* ſpirit of Niter,he thence infers, that that *Nitro-aerial* ſpirit is of a Nitro-ſalin nature,obtaining rather the nature of an *Acid* than *Fix'd* Salt; conſidering alſo,that the Effects of Fire anſwer to a very ſubtile and corroſive Salt.

Theſe things being thus by our Author preſuppos'd, he deſcends to the Explication of the Nature of *Fire*, and makes its Form and Eſſence principally to depend from the ſaid Nitro-aerial ſpirit put into motion; rejecting the opinion of thoſe,that will have Fire producible by the ſubtile and briskly mov'd parts of *any* matter, and declaring on this occaſion his diſſent from thoſe Philoſophers,that deduce all Effects of Nature from the ſame Uniform Matter,and the various Modifications thereof *; which he thinks inconſiſtent with the *Phænomena* of Fire,not at all, *in his opinion*,producible but by a certain determinat kind of particles, ſuch as he calls *Nitro-aerial*.This he endeavors to prove by divers Experiments.

* *Compare herewith the Conſiderations of the Noble* R. Boyle *about the* Excellency and Grounds of the Mechanical Hypotheſis, *printed at* London *this preſent year* 1674.

Having done with the *Aerial* part of the Spirit of Niter, he proceeds to its *Terreſtrial* and *Acid* part, and labors to ſhew, How the Spirit of Niter is produced in the *Earth*. For the better underſtanding whereof, he premiſes ſomething concerning the *Spirit of Sulphur* and other *Acid* liquors; teaching, that that Spirit does not exiſt in Sulphur before deflagration or the operation of the fire; and affirming, that, *as* the *Nitro-aerial ſpirit* of the Fire,by a very brisk motion and efferveſcence contending with and acting upon the *Salino-ſulphureous* particles, does in a very ſhort time comminute and render fluid the Salin parts included in the Sulphureous; *ſo* the ſame Spirit,boyling up by a more remiſs motion with the ſame Salino-ſulphureous parts, doth in a longer time turn the Salin parts into an *Acid* liquor. Where he takes occaſion to diſcourſe, How Liquors in general become *acid* by the operation of the Nitro-aerial Spirit; as alſo,Wherein Fermentation conſiſts,viz. In the efferveſcence of the Nitro-aerial particles with the Salino-ſulphureous ones of the liquor.

This being explain'd,he thinks it not difficult to underſtand, How the *Acid* ſpirit of *Niter* is generated in the *Earth*; declaring,That,*as* the Nitro-aerial Spirit,put into a vehement efferveſcence with the particles of common Sulphur, doth ſooner or later exacuate and make fluid the Salino-metallic parts thereof; *ſo* the ſame Spirit penetrating into the bowels of the Earth,falls there upon the Terreſtrial ſulphur,and therewith fermenting,ſo breaks and attenuates the Salin parts harbour'd therein, that at length they becom flexil, liquid, and highly acid; and theſe Salin parts being thus reduced to fluidity, become a fit receptacle for the Nitro aerial ones to lodge in; from the ſtrict union of both which he affirms ſuch a Spirit of Niter to be conſtituted, as is obtain'd by Diſtillation. And theſe particles of the Nitrous ſpirit being thus generated in the Earth,meeting with the Seeds of Fixed Salt,harbour'd in the Earth, do quickly embrace the ſame, and being cloſely combin'd with them, make up that Salt called *Niter*. So that, according to this Author,*Sal-Niter* is made up of a threefold Salt; whereof one the moſt Active, deduces its origin from the Air, and is of an Ethereal and Igneous nature; and this by its Architectonical power forms to it ſelf out of a Terreſtrial matter a Salin vehicle, which,together with the Igneous ſalt reſiding in it, conſtitutes the Spirit of Niter: Which as ſoon as 'tis generated,falls a working upon the Fixed ſalts of the Earth brought to due maturity, and together with them makes up the *Common Niter*. From this *Nitro-aerial Spirit* he derives all *Fermentations* tending both to the Production and Diſſolution of things. From the ſame he deduces *Rigidity*, and particularly *Congelation*, and the Expanſion made therein; where he examines the explication given by *Des-Cartes* of the Rarefaction of congealed water. And as he makes Rigidity the Effect of that Spirit, ſo he would have the Reſtitution of Rigid and inflected Bodies, in which conſiſts *Springineſs*,to reſult from the ſame. And acknowledging, from the many *Boylean* Experiments *,that the Air is endow'd with a conſiderable Spring, he attempts to give an account, whence that Elaſtique power ariſeth; taking it for granted, that the Air contains ſtore of thoſe Nitro-aerial particles, that to him are abſo-

* *To be met with in Mr.* Boyle's *Phyſico-Mechanical Experiments of the year* 1660. *at* Oxford, *and the Continuation of the year* 1669. *at* Oxford; *where the conſidering Reader may find a full information of what our Author here declares.*

abſolutely neceſſary to make Fire, of which the Air being exhauſted by Deflagration, the Fire muſt needs be extinguiſh't; and aſſuming thereupon, that the *Elaſticity* of the *Air* proceeds from ſuch Aerial particles as maintain Flame; having found, *as he ſaith*, by Experiments, that Air deprived of thoſe Nitro-aerial parts looſeth its Springy vertue; which vertue he alſo affirms to be leſſened by the *Reſpiration* of Animals, who, in his opinion, do exhauſt out of the Air certain Vital, and thoſe Elaſtique, particles; inſomuch that he doubts not but that ſomething Aerial, abſolutely neceſſary to life, paſſeth into the Blood of Animals by means of their Reſpiration; whoſe neceſſity therefore he cannot acknowledge to ariſe from thence only, that thereby and by the Motion of the Lungs the maſs of Blood may be communicated, as ſome have aſſerted: Concluding at laſt, that *Fire* and *Life* are maintain'd by the ſame Aerial parts; and giving a reaſon, why an *Animal* is able to live in a Receiver a while after a *Candle* is extinguiſh't; which is, that, *in his opinion*, there is required a greater quantity of Aerial particles to the burning of a *Candle*, than the maintaining of *Life*. Whence yet he would by no means have it infer'd, that, though Flame and Life are maintain'd by the ſame particles, therefore the Maſs of blood is *kindled*, as ſome teach: Which doctrine how ſolidly our Author diſputes againſt, we leave to thoſe that are concern'd to examin.

Mean time, finding great difficulties in this matter of *Springineſs*, he conſiders, by what ways the Elaſtique vertue of things may ariſe; where he concludes, that, though it may partly proceed from the agitation of the Aerial parts by a ſubtile matter interſperſed amongſt them; yet it ſeems to him, that the Spring of the Air doth chiefly proceed from, and conſiſt in, this, that the rigid parts of the Air, being compreſt by the weight of the incumbent Atmoſphere, and thereby inflected, do endeavour to expand themſelves.

Next, he attempts to explain, How the Air comes to looſe its Spring in *Flame*; affirming, that foraſmuch as the Rigidity of the *Ramous* parts of the Air proceeds from the *Nitro-aerial* corpuſcles therein infixed, and the Spring from that Rigidity, therefore the *former* parts of the Air being deprived of the *latter*, they not only become unfit to maintain the Fire, but alſo from rigid become flexile,and conſequently looſe their Spring.

Here he takes occaſion to deliver his thoughts again of the Nature of *Fire*, which ſeems to him to be nothing elſe, than a *Congeries* of very minute ſparks copiouſly ſtruck out of the Aerial parts by the alliſion of the ſulphureous ones; eſteeming the Aerial parts ſolid and rigid enough, to have fire ſtruck out of them.

This done,he further declares,that the Nitro-aerial particles, from which,*in his opinion*, the Spring of the Air proceeds, are lodged in the very parts of the Air, and carried away from it by the Burning of a Candle,or the Reſpiration of Animals; ſo that, *to him*, thoſe Nitro-aerial and Elaſtique parts, that come to fail,are not the Air it ſelf,but the ſubtileſt and the moſt active part thereof, which being expelled by burning or reſpiration, the Air becomes effete,and deſtitute of its Spring.

Moreover, he conſiders,How the Air, when deprived of its Nitro-aerial parts,is afreſh ſupplied with them? Likewiſe, he takes occaſion to declare his opinion, firſt,of the nature of the *Sun*, viz. That it ſeems to be nothing elſe than a vaſt *Chaos* of Nitro-aerial corpuſcles, wheeled about by a perpetual and very ſwift rotation; ſecondly, of the Nature of *Cold*, that it is ſomething *Poſitive*,conſiſting in this,that the Nitro-aerial parts, which being vehemently mov'd conſtitute the Body of the Sun, do, when removed from the Sun into the Midle region of the Air,ceaſe from that motion of Circumgiration, and either totally ceaſe,or move on *punctim* like ſo many briſtles or darts.

Further,he obſerves,that ſince the parts of the Air being deprived of the Nitro-aerial Spirit are raiſed upward, and being there impregnated afreſh,return thence downward again;therefore the Air, being the Blood as 'twere of the *Macrocoſm*, is in a continual Circulation,and doth it ſelf,foraſmuch as in circulating it takes in the Nitro-aerial Spirit, exerciſe a kind of Reſpiration.

Hereupon he proceeds to explain,In what manner the Nitro-aerial Spirit is breathed in by Animals; and how it comes to looſe in them its Elaſtique power; and of what uſe it is being inſpired: where he teacheth, that thoſe Nitro-aerial parts are in Animals as well as in Vegetables the principal Inſtrument of

Life and Motion; and that the Fermentation both of the Blood and the Vegetable Juice depends on the ſame.

Then he paſſes on to deliver his opinion about the *Flamma vitalis*, eſteeming, that the Fermentation of the Blood and conſequently the Incaleſcence of it ariſeth from its Nitro-aerial parts boyling up with the Salino-ſulphureous ones, without a neceſſity of having any recourſe to ſuch a Flame; which he doth ſomewhat ſarcaſtically exagitate, thereby provoking the Maintainers thereof to a vindication, if the matter will bear it.

This done, he inquires, Whether Air may be generated *de novo*, and, on this occaſion, recites an Experiment, which he ſaith is *like* to one, formerly made by Mr. *Boyle*, tending to prove the *Affirmative* of the Queſtion. Concerning which, this Author is of opinion, that though the *Aura*, produced by that Experiment, and by others here recited, be endow'd with a no leſs ſpring than the Air we breath in; yet 'tis no *true* Air, ſuch as contains vital and igneous parts; for as much as that *aura*, wherein he found an Animal and a lighted Candle to exſpire, was, *as he ſaith*, endow'd with a ſpring as well as an unviolated Air, but deſtitute of Nitro-aerial and Vital parts. Mean time, he ſuggeſts an Experiment to diſcover, whether the pretended new generated Air be true Air indeed and fit to maintain any Life; and by that Experiment determins this matter in the *Negative*, though he denies not that there is a great affinity betwixt them.

After this, he ſpends a *Chapter* in diſcuſſing, How *Fire* is kindled and propagated, and in what manner all *Fermentations* are made, namely by the pulſation of the Carteſian *materia ſubtilis*, whereby as by a ſubſtance that conſtantly moves, *he ſaith*, the Ignited parts are put into a vehement motion. And here he declares, that *Fire* ſeems to him to be nothing elſe than a very great Fermentation of Nitro-aerial and Sulphureous parts; and concludes, that, *as* the moſt vehement motion of the igneous particles proceeds from thence, that the ſulphureous ones paſs into the particles of the Niter or Air, and there hitting upon the briskly agitated *materia ſubtilis*, are by the impulſe of the ſame, together with the Nitro-aerial parts, found in the ſaid ſubſtances, by an Elaſtique impetus ſtruck out; *ſo* all the more remiſs

Fermentations of Natural things are cauſed hence, that the ſaid Nitro-aerial particles, penetrating the Salino-ſulphureous maſs, do enter into the body of the *Subtile matter*, by which, being put in a great agitation, the ſaid Nitro-aerial parts are protruded together with the Sulphureous ones; ſo that the Effervescence of Fire ſeems to him to differ from the more remiſs Inteſtin motions, by which Vegetables are generated or diſſolved, only in this; that in Fire the Nitro-aerial particles being cloſely joyned with the Fixed Salt or parts of the Air, are by the impulſe of the Sulphureous parts and the ſubtil matter carried away with violence, and put into a very ſwift agitation; whereas in other Fermentations, the Sulphureous parts not being lodged ſo faſt in the embraces of the Fixed Salt, are by the pulſation of the Nitro-aerial parts and of the *materia ſubtilis* moved with more remiſſeneſs.

Having diſpatch't this argument, he maketh an excurſion into the Ocean, and labours to give an account of that Aſcent of the waters in the Sea, which is commonly call'd a *Spout*; deducing it from a vehement *Vertigo* or whirling of the Air: of the particulars whereof himſelf may be conſulted.

Next, he diſcourſes of *Light* and *Colours*, embracing the doctrine of *Des-Cartes*, making *Light* to conſiſt in a pulſe, which by reaſon of the continuity of the luminous *Medium* is ſuddenly tranſmitted to the greater diſtance; but this Impulſe our Author would have made by his Nitro-aerial particles; as he is of opinion, that *Colours* are produced not from a light reflected, but from a peculiar impulſe of the *medium*, altogether different from that of Light; concerning which and the manner of which, the diſcourſe it ſelf may likewiſe be peruſed.

To this he ſubjoyns a *Chapter* about *Lightning*, which he denies to proceed from kindled exhalations; and having eſpouſed the *Carteſian* opinion of the production of *Thunder* from the impetuous fall of the upper condenſed and conglaciated clouds upon the lower; he thence infers, that *Lightning* is made by his Nitro-aerial particles ſtruck out of the Air, and by their vehement igneous motion cauſing a ſlight and momentaneous flaſh ſpreading it ſelf over the whole Hemiſphere. Where he adds his thoughts about the force of Lightning, and its wonderful effects, in melting Swords without hurting their Scabards, in killing Animals, in occaſioning very tempeſtuous Winds, *&c.*

This is follow'd by an Explication of the manner, how Heat is raiſed in *Quick-lime* by powring water upon it; which he deduces from two contrary Salts, the Acid and Alcali, working upon one another: So that ſlaked Lime ſeems to him to be nothing elſe but a Magiſtery conſtituted by two contrary Salts and a ſtony Earth united together. Where he adds the reaſon, why Quicklime is not heated by the affuſion of well-rectified Spirit of wine, or of Spirit of Turpentine, or any other Sulphureous liquor; *viz.* becauſe ſuch liquors are unfit to diſſolve the Salts contain'd in the Lime. To which he ſubjoyns a diſcourſe about the *Convening of contrary Salts* both with themſelves, and with other things; as alſo concerning *Precipitation*; giving withal a caution, not raſhly to preſcribe contrary Salts in the ſame Medicine, leſt the one deſtroy the efficacy of the other, or change it into a third, quite different from what it was before.

After this, he makes a digreſſion to examine the *Bath-waters*; judging them to be impregnated with a Kind of Vitriolat Tartar, or an Aluminous Salt; which Salts yet, *he ſaith*, do not deſtroy one another, but either of them falls into an effervеſcence with its contrary, for as much as thoſe Salts are ſo imperfect, that joyned together they are not able to deſtroy one another. So that he denyeth there is any ſolution either of *Niter* or *Sulphur* in thoſe waters, as hath been hitherto believed; declaring it to be a cheat, that *Silver coins* immerſed in thoſe waters are tinged *yellow*; for as much as they are rather tinged *black*, if immediately they be put into them without any previous dawbing them with a ſalino-ſulphureous dung. Nor will he admit theſe waters to be heated by any ſubterraneal fire, but with the learned *Jordan* aſſerts that heat to be produced by a Fermentation made in the bowels of the Earth: To explain which, he deſcends to conſider the *Origin* of *Fountains*, moſt of which he conceives with many others, to have their riſe from Rain-waters, and not from the Sea; which being ſuppoſed, he aſſerts, that the Air and the Rain-waters paſſing deep into the porous

Earth, and there meeting with Salino-ſulphureous mines, do excite therein a very intenſe heat, and that the Springs flowing forth from Mines thus heated conſtitute theſe hot Baths.

So much, if not too much, of the *firſt* Treatiſe. Of the other *four*, there are ***two***, ***viz.*** that of ***Reſpiration***, and the ***Rickets***, the former of which having been publiſh't once already, we have given an account thereof in *Num.* 70. of the Tracts; ſo that, for fear of being too prolix, we muſt ſay no more of it here; as we alſo ſhall forbear to diſcourſe of that other of the ***Rickets***; but haſten to make ſome mention of the two remaining Parts, treating of the ***Reſpiration*** of a ***Fœtus in the Womb*** and ***the Egg***, and of the ***Muſcular Motion*** and the ***Animal Spirits.***

Touching the *former* of theſe, our Author conſidering with himſelf, How a *fœtus* can live in the womb without the acceſs of Air, and finding the offices hitherto aſſigned to the ***Umbilical Arteries*** to be ill grounded, ſcruples not to affirm with the learned *Everard*, that the ſaid Arteries are formed chiefly, if not only, for the Uſe of ***Reſpiration***, declaring, That the Blood of the ***Embryo***, being conveyed through the Umbilical Arteries to the *placenta uteri*, carries to the *fœtus* not only the nutritious Juyce, but alſo with it a quantity of the Nitro-aerial particles, whereby the blood of the *fœtus*, by its circulation through the Umbilical veſſels, is impregnated juſt as 'tis in the veſſels of the Lungs: Whence he would not have that ***Placenta*** called any more the ***Liver*** but the ***Lungs*** of the Womb. And this ſupplement for Reſpiration he extends to the Chicken in an *Egg*, aſſerting, that the ſame doth no otherwiſe than a Child in the Womb breath by the ſaid Arteries; eſteeming, that the primogenial liquors of the Egg, furniſh't with a pure Aerial ſubſtance, being inceſſantly conveyed through the Umbilical veſſels to the Chick, perform to the ſame the office not only of Nutrition, but of Reſpiration alſo. To this he adds, that even that gentle Warmth, excited in the Egg by incubation, may alſo contribute ſomething, there to ſupply the defect of Reſpiration; foraſmuch as he ſuppoſes to have proved in his Treatiſe of *Reſpiration in general*, that the Nitro-aerial particles, by the bloods fermentation ſtruck out of the parts of the Air, ſerve Animals for reſpiration; and that, as all heat proceeds, ***in his opinion***

opinion, from ſuch Nitro-aerial particles put into Motion; ſo in this caſe, the Heat given by the incubating Bird, and received and detained in the *albumen*, is thence collected by the many ſmall ſuckers of the Umbilical veſſels, and ſo conveyed to the Chicken. Upon which ground he undertakes to ſolve that difficult *Quære, viz, Why a fœtus after 'tis born and yet cloſed up in its Membrans, may yet live for ſome hours; whereas if, being deveſted of thoſe skins, it have once taken Air into its Lungs, it cannot live a moment after without it?* Which he anſwers thus; That a *fœtus* born, and yet wrapped cloſe within the membrans, is in a like ſtate, and breaths much after the ſame manner, as a chick included in an Egg. But if, thoſe membrans being pulled away from the *fœtus*, it do, for breathing, with *labour* contract the muſcles of the Cheſt and the Midriff, it ſpends in that muſcular labor much more of thoſe nitro-aerial parts than before; whence there is a greater neceſſity for the *fœtus* to breath in the open Air, there being now nothing to compenſate the defect of that reſpiration.

But enough alſo of this Exercitation; let us paſs to the laſt, which is of *Muſcular motion*, and *Animal Spirits*. 'Tis undoubted, that the Motion of Animals is made by the Contraction of the Muſcles; but 'tis controverted, in what manner that Contraction is made? The moſt received opinion is, that the Fibres of the Muſcles are inflated by ſome Elaſtique matter, ſwelling them as to their breadth, but contracting them as to their length; though the Learned *Steno* in his *Myology* thinks it needleſs, to take in a Springy matter for the Contraction of the Muſcles; foraſmuch as he judges it may be effected by the ſole Change of their Figure. Concerning which our Author conſiders, that it appears not; 1. How that Motion, requiſite to make a change in the Figure, can be produced without the acceſſion of ſome new matter. 2. How it coms to paſs, if no new matter enters the muſcle, that in its contraction it is ſo ſenſibly hard and tenſe? And whereas Anatomiſts have hitherto taught, that the Carneous Fibres chiefly make the Contraction in muſcles, our Author thinks it more probable, that the *Fibrillæ*, transverſly inſerted into the greater *Fibres*, perform the chief part in that contraction, by reaſon as well of their poſition, as their ſize and number. And as to the Cauſe of this Contraction in theſe *Fibrillæ*, he thinks, that, beſides the *Animal Spirits*, there are alſo required to this motion ſome of the ſalino-ſulphureous parts of the Blood; and that thoſe *Animal* Spirits, that contribute to the animal motion, conſiſt of thoſe Nitro-aerial parts, which he aſſerts to be tranſmitted into the blood by Inſpiration. And both theſe parts he judges neceſſary to this Muſcular motion, becauſe he underſtands not, how that Animal motion can be perform'd without different particles mixed together and briskly moved; in regard that, *in his opinion*, it cannot be effected by Springineſs and Weight, which do the work in *Automatums*, ſince their *impetus* will ſoon ceaſe: Whence he concludes, that the Muſcular contraction is perform'd by the Effervefcence of the Salino-ſulphureous and Nitro-aerial particles; of which two he endeavours to ſhew the *later* to conſtitute the very Animal Spirits, proceeding from the Brain in ſuch Animals as commonly are call'd *perfect*, and (according to *Malpighius*) from the *Medulla ſpinalis* in *Inſects*. But, though our Author aſcribes ſo much to the *Nitro-aerial particles* as to make them the ſame with the *Animal Spirits*; yet would he not have us think, that he believes the *Senſitive Soul* to conſiſt in a *Congeries* of Animal Spirits, ſince he conceives that Soul to be a thing different from them, and to conſiſt of a matter yet more ſubtile and æthereal; of which thoſe nitro-aerial particles, that is, the Animal Spirits, are the inſtrument of operation. And concerning that *Senſitive Soul* he thus declares his mind, *viz*. That it is a more divine *aura*, endow'd with ſenſe from its firſt creation, and coextended to the whole world; a ſmall portion of which being contain'd in a duely diſpoſed ſubject exſerts ſuch functions, as we ſee and admire in the bodies of Animals.

Having diſpatch't this *Hypotheſis* about the nature of Animal Spirits, he endeavours to explain from thence the manner of all Fermentations and Concoctions performed in the *viſcera* of Animals, and particularly in the *Stomach*, *Pancreas*, and *Spleen*; in the laſt of which he takes occaſion to ſhew, *both* how the Fixed Salts in Animals are volatilized, *and* that from Plants, (which he ſaith are furniſh't with no Volatil Salt) if they be laid to putrify, a conſiderable quantity of Volatil

Salt may be extracted by diſtillation*.

He concludeth this part by ſhewing, 1. In what manner the *Fibrillæ* of the Muſcles are contracted; namely, not by Inflation, but Contorſion, as very conſentaneous to the conſtriction and hardneſs of contracted Muſcles, as well as to that ſtrong Traction of the Muſcles, ſometimes perform'd with a wonderful vigour; to which he adds the fitneſs of the motion of the Nitro-aerial particles (by which the Muſcular contraction is, *in his ſentiment*, perform'd) for ſuch a Contorſion; enforced by Experiment. 2. How the Muſcles themſelves are mov'd; *viz.* not by bringing the extremities of the ſhortned fibres to the middle, but by drawing the looſer end and the middle part of the contracted fibres to the faſtn'd end, or to the head of the Muſcle, which is a fixed and immoveable tendon. 3. How the Diaphragme, and the Heart are contracted; and how *Saltation* is perform'd. But apprehending we have already been too tedious in giving this account, we muſt here break off, and in theſe and ſome other particulars refer to the Author himſelf.

II. *ANATOME CORPORIS HUMANI, conſcripta ab* Isbrando de Diemerbroeck, *Med. & Anatomes Profeſſore, Ultrajecti*, 1671. *in* 4°.

THis Comprehenſive Body of *Anatome*, but lately come to my hands, conſiſts of 12 Parts or Books: The *firſt*, *ſecond*, and *third*, treat of the *three Venters* of the Human Body, as they are wont to be call'd by Anatomiſts; the Author having premiſed thereunto ſome general Conſiderations touching the great diverſity to be met with therein, as to its outward Form, Size and Colour; where he takes particular notice of the Obſervations, made *both* by *Schouten* in his voyages, of having found about the *Straights of Magellan*, Men of ten and eleven Cubits high; *and* by *Fazellus* in his 1. *decad. lib.* 1. *c.* 6. of men found, ſome 17, ſome 18, ſome 20, and even 22 Cubits tall.

Treating of the Concoction made in the Stomach, he conſiders the Cauſe of *Chylification*, why the aliments there are turned into Chyle rather than into Bile, Blood, *&c*; examining alſo the opinions of Phyſitians concerning the Cauſe of *Hunger*, and ſubjoyning his own, illuſtrated by Hiſtories, ſhewing, that ſuch as have faſted for a couple of dayes, are not then ſenſible of hunger, and find no other trouble but that of feebleneſs of Body. Here alſo he diſcuſſes three Problems: 1. What is the Cauſe of Unnatural Appetite, call'd *Pica*? Which cauſe he placeth rather in the Brain than the Stomach. 2. Whether in a depraved conſtitution and concoction of the ſtomach, the Bile may be made in the ſame, ſuch as in the *Cholera morbus* is voided both upward and downward? Which he denyeth againſt *Regius* and others. 3. Whether *all* the Chyle flows out of the ſtomach into the Guts? Which he anſwers in the *Affirmative*, refuting thoſe that aſſert, part thereof to paſs by the *vas breve* and other neighbouring *gaſtric* veins into the Spleen; and aſſigning the manner of the ſudden refection of the body after eating and drinking.

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* *Compare this with what the Ingenious Dr.* Daniel Cox, *a Fellow of the* R. Society, *publiſh't four months ſince, in* Numb. 101. *of the* Philoſophical Tranſactions; *where it will appear, that that learned Gentleman hath ſet down the whole proceſs of the* manner of this Extraction, known to him many years ago, for which he deſerves due acknowledgment.

This done, he diſcourſes of the Uſe of the Chyle, and inquires, Whether any parts of the Body are immediately nouriſh't by the Chyle before its converſion into blood? Which he reſolves in the *Negative*; though he affirms withal, that whilſt the Blood is the ultimate aliment of all the parts, the Chyle doth humect the ſtomach and the milky veſſels.

Treating of the *Meſentery*, and the many and conſiderable Glanduls thereof, he obſerveth, that from the obſtruction of thoſe Glanduls, Fluxes and Atrophies are frequently occaſioned; refuting withal the opinion of *Riolan*, who makes the glanduls of the Meſentery the root of all ſtrumoſity.

Examining the *Pancreas*, he reproveth thoſe that would deduce almoſt all the origins and cauſes of diſeaſes from the vitiated humor of the *Pancreas*: Where he alſo rejects Dr. *Wharton*'s opinion concerning the Uſe of this part, *viz.* that into it are voided the excrementitious juices of the Nerves.

Searching into the *ductus thoracicus* (the conveyer of the Chyle,) he declares, that that winding Circle of *De Bills*, into which he affirmed the ſaid *ductus* to be propagated at the place of the diviſion of the Jugular veins, is not a protraction of that *ductus*, nor receives from it any chyle, nor carries any; but a channel, in which is collected the *lympha*, conveyed out of the circumjacent glanduls and other parts, and to be conveyed into the neighbouring veins, *&c.* Here alſo he treats of that Queſtion, Whether through his *ductus* all the Chyle paſſeth to the ſubclavial veſſel? which he anſwers affirmatively, except that ſometimes, yet very ſeldom, and in an extraordinary caſe it flows to the Bladder, and ordinarily in Women with child to the Womb, and in thoſe that give ſuck, to the Breaſts. Refuting withal *Regius*, *Deuſingius*, and others, that labour to maintain the contrary.

Inquiring into the *Lymphatic* Veſſels, he explodes the aſſertion of the ſame *De Bills*; teaching, that the *Lympha* is the ſelf ſame liquor with the chylous Juyce contain'd in the Lacteals, and that it paſſeth out of the Chyliferous veſſels into the Liver and Glanduls, and from thence into the Spermatic veſſels for their humectation and nouriſhment, and not from the Glanduls and Liver to the Chyliferous veſſels. Having diſpatch't this controverſy, he examines, What kind of liquor this *Lympha* is? Where having endeavoured to diſprove the opinion of Dr. *Gliſſon*, eſteeming it to be made of the Steams of the Blood, collected like dew, and impelled into theſe Veſſels, and repaſſing with the vehicle of the aliment carried through the Nerves; he aſſerts the *Lympha* to be a peculiar ſubtile liquor, ſeparated in the conglobate glanduls from the *Serum* of the Blood, and embued with ſtore of volatile Salt and with ſome Sulphureous particles, getting into thoſe ſmall veſſels, and by them convey'd partly into the chyliferous veſſels, partly into many veins; into the *former*, the more to attenuate the chyle and thereby to facilitate its dilatation in the heart; into the *later*, to prepare alſo the Venal Blood to a more expedit rarefaction in the ſame part. Before he leaves theſe veſſels, he notes, that the rupture of them often cauſeth the *Aſcites*, and that their being obſtructed occaſions other dangerous diſeaſes.

In the Anatome of the *Liver*, he chiefly commends the accuracy and diligence of Dr. *Gliſſon* and Signor *Malpighi*, eſpecially as to the poſition of the branches of the *vena cava* and *porta*, and the veſſels of the Bladder of Gall, and how the Blood of the *Porta* enters into the roots of the *Cava* and thoſe of the ſaid Bladder, not by opening themſelves into one another, nor by having their branches inſerted into the ſides of one another, but only by ſending the ſanguineous liquors through the ends of the ramifications of the *porta* into the ſubſtance of the Liver, and from thence conveying the ſaid liquors into the extremities of the *cava* and the veſſels of the Bladder of Gall: Where he alſo expreſſes his agreement to the aſſertion and ſolid proof of the learned Dr. *Gliſſon*, importing, that in the Liver there is not any *anaſtomoſis* of any veſſels: Whence he concludes it to be evident, how that in other parts alſo the Circulation of the blood is perform'd not by the ſole *anaſtomoſis* of the *arteries* with the *veins*, but by the very pores of the ſubſtance of the parts themſelves. Further, having with moſt of the modern Anatomiſts denyed *Sanguification* to be performed in the Liver, and aſcribed to it, and the Spleen together, the province of making the Ferment of the Blood, to render it ſpirituous; he ſubjoyns two or three Obſervations of perſons cured of conſiderable wounds inflicted in the Liver; and another of a youth whoſe Liver was immediately joyned to his Lungs, without any other *diaphragme* or *mediaſtinum* at all; as alſo of one *Ortelius*, that had neither Liver nor Spleen, and whoſe *vena cava* proceeded out of the Guts themſelves; concerning which later caſe the ſagacious *Malpighi* conjectures, that the glandulous ſubſtance of the Liver in the ſaid *Ortelius* extended it ſelf all along his Guts.

In the examination of the Juyce of *Gall* he obſerves, that that liquor doth not only promote the excretion of the *faces*, but is alſo highly neceſſary to the fermentation of the Chyle & Blood; and teacheth, that it is a fermentative Juyce prepared in the Liver out of the Sulphureous parts of the Venal blood, and the Saltiſh and Sub-acid liquor of the Spleen; refuting not only the new opinion of *Sylvius* and *Regius* concerning the generation of this liquor; but alſo that of *Malpighius*, importing, that the Bile is not generated out of any blood, or by a concoction of divers Juyces made in the Liver, but only ſeparated from the Blood by means of the Kernels of the Liver. After this he diſcuſſes and diſproves the doctrine of *Backius* and *Sylvius* about the motion of the *Bile*, aſſerting it to be produced in the *folliculus*, and to paſs partly through the common *ductus colidochus* into the Guts, and partly through the *porus bilarius* into the Liver,

ver, there to mix with and to attenuate the Blood; but that nothing of the Bile flows out of the Liver through the ſaid *porus* into the Guts.

In the diſquiſition of the *Spleen*, he highly applaudeth the diſcovery of the excellent *Malpighius*, who found it to be wholly made up of litle membranous cells like hony-combs, accurately explained in his diſſertation *de Liene c.*5. and formerly deſcribed in theſe Tracts *numb.* 44.*p.*890. As to its *Uſe*, he thinks that to be no other, than to make out of the Arterial blood a ſub-acid matter, from which, being anew concocted with ſulphureous particles in the Liver, is made a bilious Ferment of the Blood and Chyle. Entring here upon the conſideration of the *neceſſity* of the Spleen in the Body, and relating amongſt other particulars, that it having been written out of *England*, that thoſe Bitches, of whom the Spleen had been cut out, had proved ſteril afterwards, Dr. *de Graef* had thereupon made himſelf an Experiment upon a Bitch, which having been depriv'd of her Spleen, had afterwards conceived and brought forth puppies: Which ſtory is certainly grounded upon a miſtake, foraſmuch as 'tis moſt notorious over all *London*, that, divers years ſince, a Bitch, yet alive, of a conſiderable Noble-man, after ſhe had loſt her Spleen, hath been ſeveral times with puppies, of which ſome, out of curioſity, were opened, and found to have a very fair Spleen.

Our Author having explain'd the ſtructure and uſe of the *Pancreas*, the Liver, Bile, Spleen; ſpends a whole chapter upon the Ferment of the Blood and Chyle, to which he Judgeth that the operations of the Liver, Spleen and Pancreas do joyntly concur; where he takes occaſion to diſcourſe largely of the matter, nature, preparation, and manner of working of Ferments; and obſerves particularly, from whence thoſe ſharp and fermentative particles in our Bodies are derived; adſcribing their origine to Sulphur and Salt, to be found in all aliments; the *former* cauſing the firſt commotion, and the *later* the principal acrimony. To all which he adds the Inconveniences and Diſeaſes ariſing in the Body from the want of the due manner and competent degree of Fermentation in the Juyces thereof.

Next, our Author proceeds to the conſideration of the *Kid-*

neys, where, having rejected the opinion of *Hieronymus Barbatus*, teaching, that the *Serum* is as alimentary to the Spermatique parts, as the *Blood* is to the Carneous; he highly commends what Signor *Malpighi* hath detected in the Kidneys *lib. de Renibus*, (of which ſee alſo *Numb.* 44. of theſe Tracts *p.* 890.) and diſcourſes at large of the manner of the Separation of the *Serum* from the blood, which, in his opinion, is done by a peculiar fermentation made in that part; yet leaving it in the dark, How by that efferveſcence the ſerous part of the blood, together with many impurities, is ſeparated, and what configuration it acquires, fit to paſs alone through the pores of the Kidneys, with excluſion to the Blood? And, which is much more ſtrange, How divers ſolid and hard bodies, as Needles, ſmall Nails, Fennil and Anni-ſeeds, *&c.* (of which here are alledged Examples well atteſted,) can be excreted with Urine, but without blood? To render ſome tolerable account of which *phænomena*, as alſo, to conceive the better, How Spaw-waters can be in ſo great plenty voided, without paſſing through the heart, lungs and kidneys, & without moleſting the Heart; our Author ſuſpects, there are ſome Lacteous veſſels, going ſome yet unknown way to the Bladder and Womb; which ſuſpition he confirms by this, that ſometimes a chylous milky matter hath been ſeen voided with the urine: By which way he imagins alſo that thoſe liquors do paſs, whoſe colour and ſcent do remain unchanged in the Wine: of which caſes he names ſeveral, not only of Oyl of Turpentine, and Aſparagus (which are commonly known to do ſo,) but alſo of a black medicin, rendring black the Urin, ſoon made after it; of Saffron given to a Woman in travel, and having tinged the child, born within a quarter of an hour after; of ſome, that had eaten the roaſted fat of *Lamb-Kidneys*, which by the Author himſelf was ſeen ſoon after to come almoſt all away with the Urine, *&c.*

Treating of the *Parts of Generation*; he animadverts upon *Veſlingius* and others, that teach the ſpermatique veins and arteries to terminate in the *Paraſtatæ*, and there to be changed into the *vaſa deferentia*, as bodies continued to them; whereas he thinks it evident, that thoſe veſſels do not enter into the *paraſtatæ*, but the *teſticles* themſelves; which *later* being diſcourſed of by him, he not only alledges examples of ſome, that had 3 *teſtes*, but alſo an inſtance of one that was born without any at all, and yet acted the part of virility *in coitu*. Then he rejects the opinion of thoſe, that hold a threefold *Semen*, elaborated in three different parts, and neceſſary to generation: He ſhews alſo, how caſtrated animals may engender; and yet how inconſequent it is, that becauſe ſome animals deſtitute of teſticles do generate, therefore the *teſtes* do not *conficere ſemen.* Proceeding to the Femal Sex, he inquires into the nature of the *fermentum*

mentum uterinum quod inducit menſtrua; and examins, Whether a *fætus* may be formed *extra uterum ?* Whether the *uterus* do remove from its place in hyſterical women ? How fætid things do help in hyſterical fits ? Whether a *fætus* can be born, the mother being dead? *An mulierum genitalia ſolo ſitu à virorum genitalibus differant ? An mulier mutari poſſit in virum* ? What is the conſtituent matter of the *Seed* ? Whether any thing beſides Arterial blood, and Animal Spirits? How imagined *ideas* are imprinted in the Seed? Whence comes the external likeneſs in the *fætus?* Whether the *ſemen muliebre* be the formative cauſe of the *fætus*, and the *virile* be only a ferment to open and put into act the forming power of the Femal ſeed ? What may be ſaid to the *Harvean* Obſervations concerning the non-appearance of the ſeed ſoon after the coit ? Further, he conſiders the whole work of the Formation of the *fætus* ; and inveſtigates , what is its power ? Whether the ſeed be actually animate ? Whether a Vegetative Soul be to be admitted in Man ; and wherein that conſiſts ? Moreover he inquires, Whether the Nutrition of the *fætus* is perform'd by the Navil, or the Mouth, or by both ? and reſolveth for the laſt ; alledging, for the Nutrition by the Mouth, among other arguments, an Obſervation he made of a child of his own, which about an hour after it was born did void at the mouth a copious milk, before it had ſucked or taken in any thing. Next, he diſcuſſes that great queſtion, Whether the *fætus* reſpireth in the womb ? And reſolves it in the *negative* ; aſſerting on this occaſion , that a *fætus* never cryes in the womb, *&c.*

Paſſing on to the *Midle Venter*, or the Cheſt; he there examins the *Breaſts*, and particularly, Whether there be a communication of their Lacteous Veſſels with any Chyliferous channel? Whether the Chyle do paſs through the arteries themſelves to the Breaſts? What Milk is? How 'tis produced of the Chyle? What impells the Chyle to the Breaſts? Concerning which laſt queſtion, he declares his opinion to be, that 'tis a ſtrong imagination, and an earneſt and frequent thought and deſire of milk and giving ſuck, which works that impulſe ; foraſmuch as the vehement paſſions of the mind are able to cauſe various motions of the Spirits and humors ; where the Author taketh pains to ſhew, how this cauſe hath place in *Brutes* ?

Treating of the *Heart*, he will not admit it to be a *Muſcle*, and endeavours to ſolve the arguments alledged to prove it to be one. He recites divers memorable Examples of men wounded in the Heart, yet not dying preſently, *&c.*

In the *Lungs*, he conſiders its ſtructure out of *Malpighius*; obſerves the many odd things, often found in them, and, among the reſt, ſtore of ſtone-duſt in the the Lungs of a Stone-cutter; aſſigneth them the office of Reſpiration, to refrigerate and condenſe the blood, and ſo to make it paſs to the left ventricle of the Heart. Where he contends againſt thoſe, that would have ſome Air mix it ſelf with the blood, and thoſe alſo that would reject Cooling as the chief Uſe of Reſpiration ; and particularly againſt Dr. *Thruſton*, for diſcharging the Heart from the office of Sanguification, and charging the ſame upon the Lungs. To which he ſubjoyns a *Quære, viz.* Whether a man born can live any time without Reſpiration? Alledging divers notable examples of men, that have done ſo.

Proceeding to the *third Venter*, the *Head* , he endeavours to refute the *Carteſian* opinion about the Origin of the *Brain*; and then, among many other particulars , animadverts on thoſe that alledge Inſtances of human bodies, that were deſtitute of all Brain , which he is unwilling to believe, ſuſpecting , that it is grounded only upon ſuperficial inſpection. Which done , he diſputes againſt both the *Carteſian* uſe of the *Conarion*, and that aſſigned by Dr. *Wharton*; as alſo againſt the Office, aſcribed by Dr. *Willis* to the *Cerebellum*, *viz.* to ſerve for the performing of the Involuntary functions and actions of Animals. After which he diſcourſes largely of the *Animal Spirits*, attempting to diſprove Dr. *Gliſſons* doctrine about the matter, whence thoſe Spirits are generated, and that alſo of *Des-Cartes*, eſteeming them not to differ *Specie* from the *Vital*: Himſelf in the mean time affirming them to be prepar'd in the Brain, chiefly out of the ſalin and a few ſulphureous particles of the Blood, and deſign'd not only for the *animal*, but alſo for ſome of the *natural* actions of the body, eſpecially the nutrition of the *ſpermatic* parts, *&c.*

Paſſing to the *Eye*, he gives the anatome of the ſtructure of this organ, and the conſideration of the Uſes of every part thereof. The like he does as to the *Ear* , and the reſt of the Organs of our Senſes. Diſcourſing of the *Tongue*, he will not acknowledg that part to be a Muſcle, as *Spigelius*, *Bellinus* and others take it to be. Speaking of the *Salival channels* , he takes notice of the contention riſen between *Blaſius* and *Steno* concerinng the priority of their diſcovery, *&c.*

Having diſpach't theſe 3. Books, and in them the *Three Venters* he goes on to the remaining *ſeven* Books, which he diſpatches with more brevity; treating therein of the *Artus*, the *Muſcles*, with an *appendix* about the *Membrans* and *Fibres*, the *Arteries*, the *Veins*, the *Nerves* (not allowing of Dr. *Gliſſons* doctrine, that the Nerves convey the nutritious Juyce,) the *Bones*, the *Cartilages* and Ligaments, concerning which we cannot here enlarge.

ERRAT. In Numb. 104. *p.*70. *l.*29. *r.* decay. *In this* Numb. 105. *p.*90. *l.*18. *r.* for the annual. *p.*95. *l.*14. *r.* The button V, *ib. l.*18. *r.* upon it; 6, the Hammer, *p.*96. *l.*15. *r.* the hollow place, r, in fig. 1. *ib. l.*17. *r.* hole, 1.2.3.4. in fig. 2.

London, Printed for *John Martyn*, Printer to the R. Society 1674.

Numb. 106.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *Auguſt* and *September*.

Septemb. 21. 1674.

The CONTENTS.

Microſcopical Obſervations from Mr. Leeuwenhoeck, *about* Blood, Milk, Bones, *the* Brain, Spitle, Cuticula, Sweat, Fatt, Teares; *communicated in two Letters to the Publiſher. An Account of a notable Caſe of a* Dropſy, *miſtaken for Gravidation in a young Woman; imparted by a Learned Phyſitian in* Holland. *An Account of three Books:* I. *DE SECRETIONE ANIMALI Cogitata*, *Auth.* Guil. Cole, *M. D.* II. *Eraſmi Bartholini SELECTA GEOMETRICA.* III. *LOGICA, ſive Ars Cogitandi; ex Gallico in Latinum Sermonem verſa. Some Animadverſions upon the* Latin *Verſion, made by* C. S. *of the* Phil. Tranſactions *of A.* 1665. 1666. 1667. 1668.

Microſcopical Obſervations from M. Leeuwenhoeck, *concerning* Blood, Milk, Bones, *the* Brain, Spitle, *and* Cuticula, *&c. communicated by the ſaid Obſerver to the Publiſher in a Letter, dated* June 1. 1674.

Sir,

YOurs of 24th of *April* laſt was very welcome to me; Whence I underſtood with great contentment, that my Microſcopical Communications had not been unacceptable to you and your Philoſophical Friends; which hath encouraged me to proſecute ſuch Obſervations, concerning which I ſhall at preſent impart to you what follows:

1. The ſmall Red Globuls in the Blood, formerly ſpoken of *, are heavier than the Cryſtalline liquor in which they are carried, becauſe ſoon after that the Blood is let out of the Veins, thoſe Globuls by little and little ſubſide towards the bottom;and being made up of ſoft fluid Corpuſcles, and many lying upon one another, they do unite themſelves cloſe together, and by this cloſe conjunction the Blood that is under the ſurface alters its colour, and becomes dark-red or blackiſh; as I have obſerved ſeveral times: of which I take the reaſon to be, (with ſubmiſſion to better Judgments) that the Air cannot move every way round about the Globuls, and hits as 'twere againſt a cloſe darkiſh body. Touching the *Florid* red colour of the ſurface of the Blood expoſed to the Air, that comes, in my opinion, from hence, that the *uppermoſt* Globuls are not preſs'd, and therefore retain their nature,and the Globuls *ſubjacent* to the uppermoſt lye cloſe together, by reaſon of which cloſe conjunction the Air or Light cannot penetrate through them, but is reflected, and ſo gives a greater light to,and about, the uppermoſt Globuls, than they had before the union of the inferiour Globuls; and this it is that makes them appear more florid.

* See *Numb.* 102. p. 23.

2. I ſhall herewith communicate the Manner *how* I have obſerv'd, among other things, *Blood* and *Milk*. I did my ſelf prepare divers ſorts of very ſlender hollow Glaſs-pipes, as A B, of which ſome were not thicker than a mans-hair; and the ſlenderer they are, the clearer will they make the red Globuls of the Blood appear. But, for ſeeing the Cryſtalline water in which thoſe Globuls move, and for obſerving alſo how they ſubſide, theſe Pipes may be made ſomewhat thicker. Having then made ready ſuch a ſmall Pipe, I tye about the uppermoſt joynt of (e.g.) my thumb a ſtring, as is uſual in opening a Vein of an Arm, and then I prick that part of my thumb with a pin, to make it bleed; this blood I wipe off, if I intend to keep any for the Air. And then I look well to the place prick't, putting upon that point my Glaſs-pipe, and withal ſqueeſing my thumb to preſs out

* *See* Fig. I.

Fig. 6.

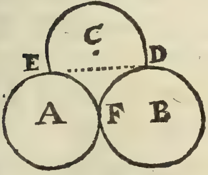


Fig 5

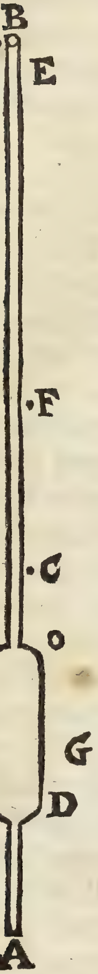


Fig. 4.

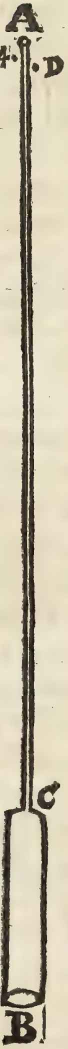
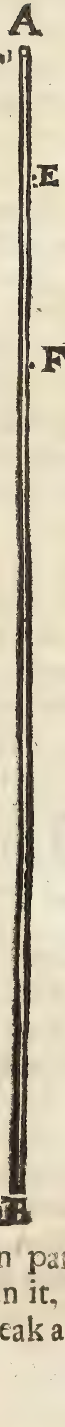


Fig. 1.



2

3

nore blood ; which being thus preſs'd out, will in part run p into the ſaid pipe: This pipe with the blood in it, I lay pon a piece of white paper, and with my nail break a little piece from it, as *Fig.* 2^d or 3^d; and ſet it to the pin of my Microſcope, having firſt a little wetted the pin with my ſpittle, or a little turpentine, to make the pipe ſtick to it; or elſe I take the whole Glaſs-pipe, and with my hand hold it before the Microſcope. Now in ſuch a Glaſs-pipe, the blood on the ſurface, and that which is under it, is almoſt of the ſame colour, although it ſtand a pretty while in it, becauſe the Globuls in the Glaſs-pipe are but few, nor lye they ſo cloſe together. The ſlenderer the pipe is, the higher will the blood riſe into it. And that the Curious in your parts might themſelves ſee this, I have uſed the freedom of ſending you ſome of the ſaid hollow Pipes, by the means of which I hope my above-mention'd ſpeculations will be verified.

The red Globuls of the Blood I reckon to be 25000 times ſmaller than a grain of ſand; which perhaps will to many ſeem incredible: But the matter being about figured Bodies, 'tis known, that, two Globes being given, the Axis of one whereof is 1, and that of the other, 20, the proportion between their magnitudes is as 1 to 8000; Spheres being in a triplicat proportion to their Diameters. The ſame red Globuls, when they are ſingle, and ſtick within to the ſides of the Glaſs-pipes, will appear white and colourleſs.

3. Further, if your Curioſity ſhall lead you to obſerve the motion of thoſe red Globuls thorow the Cryſtallin liquor, be pleaſed to take one of the thicker ſort of theſe pipes, filling it with blood from E to F, and ſo putting the lower end B, a little into the flame of a Candle, and cloſing it hermetically. Which done, ſet the pipe upright, with the end A upwards, that ſo the red Globuls may ſink. And deſiring to ſee the motion of thoſe Globuls, apply a little warmth to the pipe between F, B, making uſe only of a warm hand; by which warmth the Air betwixt F, B, muſt expand it ſelf into a greater ſpace, and the blood in the pipe will be driven up higher; by which means the red Globuls will in part come to move above in the Cryſtallin humidity; yet if thoſe Globuls come to joyn themſelves too cloſe together, this Obſervation will fail. *See* Fig. I.

4. I have ſeveral times endeavoured to obſerve the parts of a *Bone*, and at firſt I imagin'd, I ſaw on the ſurface of the Shinbone of a *Cow* ſeveral ſmall veins (which bone I ſtill keep by me;) but I have not found it ſince in any other bone. I thought likewiſe, I ſaw then alſo, that that Bone conſiſted of united Globuls. Afterwards I viewed the Shinbone of a *Calf*, in which I found ſeveral little holes, paſſing from without inwards; and I then imagined, that this Bone had divers ſmall pipes going longwayes: But I have ſince obſerved the *Tooth* of a Cow, and found it made up of tranſparent Globuls, which I can ſee very perfectly. The ſame I have obſerved in *Ivory* or *Elephants-teeth*. And having ſeen this ſeveral times, I doubt no longer but that all white Bones do conſiſt of tranſparent Globuls. Which being ſo, I am of opinion, that all things that appear white to our eyes, are made up of nothing but tranſparent particles lying one upon another: Such as are Snow, white Paper, Linnen, white Stones, white Wood, Scum, beaten Glaſs, beaten Roſin, Sugar, Salt, &c.

5. Again, I have obſerved the *Liver* of a *Sheep*, and that of a fat pletorick *Cow*; and they alſo conſiſted of very ſmall Globuls, which appeared ſo little as thoſe of Blood. The Liver of the Cow was of a Brown-red colour; yet viewing it in my Microſcope, I found the particles, which I took from that Liver, to have but very little colour, only they were a little bright towards the red edge, and generally beſet with very ſmall Globuls of blood; and in ſome few places the blood lay vein-wiſe. Whence I can not otherwiſe judge, but that theſe ſmall particles of blood lay up and down diſperſed through the Liver out of the veins. I cauſed part of thoſe Livers to be boyled, eſteeming, that by reaſon of their natural ſoftneſs, all could not well be obſerv'd that might be remarkable in it; and I expoſed it to dry ſomewhat hard; and thus in both of them I did ſee the Globuls: which I intend to obſerve yet further.

6. The *Brains* of a Cow being viewed by me, I found the White ſubſtance thereof to be made up alſo of very fine Globuls: As for the Gray colour of the Brain, I have not as yet my ſelf been able to obſerve any thing in it that is particular, by reaſon of its duskiſhneſs. Now that the Curious may be aſſiſted to view the particles of the Brain, I herewith ſend alſo ſome Glaſs-pipes, by me contrived for that purpoſe. A B is a hollow Glaſs-pipe, A C is of the thickneſs of a courſe horſe-hair. Its end from A to D, I thruſt into the white of the Brain (having firſt open'd it with a Pen-knife,) and to the open end B, I apply my mouth, and there ſuck as ſtrongly as I can, and during that ſuction I move the pipe by thruſting it inward and drawing it outward, ſo that the point A remains ſtill moving in the white matter of the Brain: By which means I got a little of that part of the Brain into my Glaſs-pipe, which I view in the manner above-preſcribed in the account of blood. But this I ſhall alſo obſerve again at my next conveniency *.

See Fig. IV.

* *Perhaps it will be ſaid, that the natural texture of the parts of the Brain, by being forced into theſe ſmall pipes, is much alter'd and vitiated.*

7. As to the *Marrow* of the Back-bone, I found that alſo to conſiſt of very ſubtil Globuls; yet ſome few Globuls *ſtood out*, of a bigger ſize: Whence I doubted, whether theſe bigger Globuls might not be cauſed by the labor of my ſuction and motion, having uſed the ſame way in viewing this Marrow, as I did in obſerving the Brain.

8. Having divers times obſerved the *Fleſh* of a Cow, I found it to conſiſt of very ſlender filaments, lying one by the other as if woven into a film. I have alſo viewed ſeveral filaments, which were beſet with Globuls. Theſe Globuls I judged to be blood, and that, pricking our body with a pin without hitting a Vein, the bloody Globuls did iſſue from between theſe filaments: But this I leave to further conſideration. Mean time I have with a pins point ſever'd theſe filaments from one another, and found the ſingle ones ſo fine, that any of them ſeem'd to me ſome 25 times thinner and finer than a hair. Having expoſed them to my Microſcope, I ſaw to my wonder, that they were made up of very ſmall conjoined Globuls, which in ſmalneſs ſeem'd to ſurpaſs all the reſt. This I took

notice of frequently, being unwilling to take up any thing for truth, but what I have ſeen divers times, and in divers parts.

9. Having view'd *faſting Spitle*, I found in that fluid matter carried ſome few and thoſe very ſmall Globuls, of which I obſerv'd ſome to ſubſide. I ſaw alſo therein ſeveral odd particles, ſome of which ſeem'd to conſiſt of united Globuls. But looking upon the *Spitle* in the afternoon, I found thoſe Globuls and odd Corpuſcles in a greater number. I conclude hence, that all Bodies made out of Fluid matter do conſiſt of Globuls; and am therefore of opinion, that if a drop of water could be placed in the free Air, it would be a perfectly round body, and conſequently, when out of any fluid matter in our body there are made conſiſtent particles, that they alſo muſt be preſſed together on all ſides: Which preſſure I eſteem to be greater in our Body, than if the Water ſhould preſs the Air, or the Air the Water. And by the ſame preſſure the particles are likewiſe preſſed together; whereupon muſt alſo enſue the roundneſs of their bodies.

10. The *Cuticula* or uppermoſt Skin of our Body conſiſts of round parts or ſmall ſcales, (as far as I have been hitherto able to judge:) And I fancy, that the continual growth of this *Cuticula* is made in this manner: If, *for example*, you let fall upon a white paper a little drop of Gum-water, the water will in a little time ſteam away, and the Gum will keep the ſurface of the drop. Now I imagine this Gum-water to be the humors, that are continually emitted out of our Body, whence the humidity iſſues forth from between all thoſe round particles or ſcales lying cloſe upon another, and not thorough *pores*, as many have taught. Like a cloſe and well-twiſted Cable, upon which powring continually ſome water, this water will paſs through the whole Cable and ouſe out at the end; not paſſing through any pores, but making its way about and between the filaments of the Cable, and ſo getting out beneath. And the courſer or more conſiſtent matter, which I compare to Gum, cleaves to the body, and ſo maketh the uppermoſt skin, which skin thus grows on from beneath, and is worn off from above: And the more tranſparent theſe particles are, the whiter is our skin. Which yet are but our conjectures and ſuſpitions. And the

like manner of growing I have formerly ſaid to have place in *Plants*; only with this difference, that, when the ſuperfice of a moiſt Globul, which is driven out of the Plant, is become ſomewhat ſtiff, the moiſture is then propelled out of the upper end of the plant, and that by a continual ſucceſſion. Which kind of progreſs of growing I apprehend may in ſome manner be ſeen in the Pith of *Wood*, in *Cork*, in the Pith of *Membranes*, as alſo in the White of a *Quill*; of which three laſt I have ſent you and your curious Friends ſome ſmall particles, cut off with a ſharp Pen-knife, thinking it well worth their obſervation. Only I would here advertiſe, that when any of theſe particles is applied to the pin of ſuch a kind of Microſcope as mine is, the inſtrument may be held within doors and in the ſhade, yet held to the free Air, as if with a Teleſcope you would look upon the Stars in the Firmament.

Other Obſervations made by Mr. Leeuwenhoeck, *about* Sweat, Fatt, Teares; *imparted to the Publiſher in a Letter of* July *the* 6th 1674.

1. I Have often viewed the *Sweat* of my face, which conſiſted of a Cryſtallin moiſture, in which I ſaw ſome, but very few, tranſparent Globuls, as alſo a very few, but bigger and odd particles of different forms, which latter I eſteem to be particles ſcaled off from the *Cuticula* or uppermoſt skin.

2. I have alſo obſerv'd the *Sweat* of ſeveral Horſes; firſt in ſuch, as ſwet but a little, yet ſo that I could wipe off ſome drops of Sweat from their heads: In which I ſaw likewiſe ſome Globuls ſwimming in the Cryſtallin humidity, as alſo ſome odd bigger parts: But then in Horſes that had labour'd harder, or run more violently, and ſwet ſo as that white ſweat-drops run from their body, I ſaw in them a great abundance of Globuls moving in the Cryſtallin moiſture, together with ſome of thoſe odd bigger parts, which I likewiſe judged to be ſcalings off from the *Cuticula*.

3. Heretofore I acquainted you, that I imagined to have ſeen *Hair* as made up of united Globuls, and to have alſo obſerv'd *Elephants hair* to conſiſt of the like. I cannot omit

now to communicate unto you, that ſince that time I have ſeen ſuch Globuls not only in *Mans* and *Horſe-hair*, but alſo frequently in the *Wool of Sheep*; and further, that the *Root* of the hair pull'd out of my *Eye-brows* conſiſts altogether of the like Globuls.

4. Having pull'd out of an Elephants-tayl a black Hair, and cut tranſverſly from it a thin ſcale, I expoſed it to my Microſcope, which repreſented in the thick of that Hair about an hundred little ſpecks ſomewhat whitiſh, and in each ſpeck a black point, and in ſome few of thoſe black points, a little hole; and this hair conſiſted withal of united Globuls, which yet I thought I ſhould have found bigger in this thick hair of ſo bulky a Beaſt, than indeed they were. This Scale I keep ſtill by me becauſe of its curious and elegant appearance, not unlike (excepting the colours) a Peacocks-tayl.

5. I have formerly ſent you my way of ſeeing the motion of the Globuls in the Cryſtallin liquor of the *Blood*: Having ſince contrived a more convenient Glaſs-pipe for that purpoſe, I cannot but give you and your Curious Friends notice thereof; *viz.* A B is a hollow Glaſs-pipe from B to O, about the thickneſs of a courſe horſe-hair; from O to D, about the thickneſs of a Pigeons-quil, and the thickneſs from D to A ſomewhat ſlenderer, *ad placitum.* 'Tis open on both its ends, A and B: Into this pipe I brought ſome Blood from E to F, or from E to C, and then ſeal'd the end A hermetically: Or elſe, I leave the pipe cloſed at A, and by the application of my hand or breath bring a little warmth to the thickeſt part of the Glaſs G, holding the pipe with my two fingers at F, and ſo conveying its open end B to the Blood, *&c.* Whereupon ſome of the Air in the pipe, being by the ſaid warmth driven out at the open end B, it will immediately indeavour to have its former ſtate, and ſo attract a little blood into the ſlenderer part of the pipe: which pipe I then put from A to G into a ſmall Copper-pipe, which I had cauſed to be fitted to one of my Microſcopes, and which I can move at pleaſure, nearer or further off, higher or lower.

See Fig.V.

6. I did lately view † ſome Blood, in which there was much of that Cryſtallin liquor, and

† *In one of the newly deſcribed pipes.*

going into the open Air, at a time when there were pritty ſtrong guſts of wind, I ſaw, to my great delight, continually, and without any other motion but that of the wind, the red Globuls agitated peſle-meſle, and as if each Globul had yet a ſecond motion, and that about its axe.

7. I ſhewed to Mr. *C.H.* and couched in writing, how I had obſerv'd the Blood, *&c.* furniſhing him alſo ſome of thoſe ſmall Glaſs-pipes; which together with my Letter being ſent by him to his Son at *Paris*, he had this return from him, that they had ſeen no Globuls at all in the blood, but other particles. This may happen alſo to others, who are therefore hereby advertiſed that thoſe red Globuls, ſtanding ſtill, do ſoon come to ſtick to one another, (as I have obſerv'd my ſelf more than once,) and being thus carried thorow the Cryſtallin humidity, exhibit odd and miſhapen particles: Which doubtleſs is the reaſon, why the ſaid Globuls were not ſeen by the above mention'd perſon, and why indeed they cannot be ſeen in that caſe.

8. Thoſe ſmall Glaſs-pipes, which I am wont to obſerve any fluid matter with, are cloſed by me on both ends; and when I come to make uſe of them, I break off with my nail the cloſed ends, that ſo the Earthy particles, that ſwim continually in the Air, may not get into the pipes, having frequently found, that when thoſe pipes have been open a while in the Air, they are in many places beſet with earthy particles and filaments, which, without this precaution, might be taken for parts of the matter it ſelf that is under obſervation.

9. I have heretofore view'd the *Fatt* of Mutton and Cows, and ſhew'd to ſeveral of the Curious, that it is made up of Globuls joyn'd together, which appear'd to my eye as big as ordinary hail-ſtones: Yet are we not to fancy, as if theſe Globuls, and thoſe that conſtitute a Bone and other ſolid parts, did conſiſt of Globuls *perfectly* round: For, if that were ſo, it muſt follow, that the interſtices betwixt ſuch Globuls would be triangular, or they be fill'd up with other Corpuſcles. But you are to know, that they are round but on one ſide; as, *for example*, A and B are two Globuls of Fat, that are formed firſt, and the third being a forming, and to be placed between and above A and B, it will take the form of C, and ſo

See *Fig.* VI.

ſo make up the triangular body FDE, as in the *Fig.* annext. And thus I think I ſee the groſſer parts of Fat, not perfectly round. And if any of the Curious deſire to ſee the Globuls, of which the greateſt parts of Fat are made up, they may be pleaſed to take care, that there be taken a piece of the courſeſt Fat, and that with the hand it be broken aſunder; which way being obſerv'd, there will then (yet not always) ſome ſmall particles of fat, in the midſt of the fat, be ſever'd, which being dextrouſly applied to the pin of the Microſcope, you will be able to ſee its form: For if you break off a piece of fat with a pin, you will tear the Globuls.

10. I have lately obſerv'd, that each buble or globul of Fat conſiſts of more than a thouſand ſmall Globuls. Yet I am apt to believe, that thoſe that have not ſeen the Globuls in Blood, Hair, Bone, *&c.* will not ſatisfie themſelves about ſeeing the Globuls in the Globuls of Fat, becauſe of their extraordinary minuteneſs.

11. The *Fat* of ſome *Water-foul* and *Fiſh*, though it have been view'd by me, yet ſhall I endeavor to obſerve it again before communication.

12. Having view'd the *Teares* of two infants, I found therein very few round Globuls, but much more other odd and miſhapen particles, of divers forms; ſome of which ſeem'd to conſiſt of united Globuls. I was thinking, becauſe thoſe Teares had run down the Cheeks, whether all theſe particles might not be ſcalings off of the Cuticle. For I preſume, if the Tears of a grown perſon, and ſuch as are cauſed from much grief, and are ſhed copiouſly, were well viewed, there would in all appearance be much more ſeen in them.

An Account of a notable Caſe of a Dropſy miſtaken for Gravidation in a young Woman; communicated by a Learned and Inquiſitive Phyſitian in Holland, *conſiderably enlarging the Obſervation made of the ſame Caſe by the famous Dr.* Tulpius, *lib.* 4. *Obſ. c.* 48.

SOme years ſince, there came to Dr. *D.* a young Woman of about 17 years of age, unmarried and reputed a Maid, of a florid countenance, and ſtrong body, having a good ſtomach, *periodicè menſtruata,* and wanting none of other due evacuations; not troubled with head-ach nor ſleepineſs, nor difficulty of breathing, nor drought, nor any of the ſymptoms incident to Hydropical perſons. This young woman having her belly ſwollen to exceſs in three months time, was much ſuſpected by the Phyſitian whom ſhe addreſſed her ſelf to, as if ſhe had been deflowred; which yet with many imprecations ſhe denied, though in vain: the Phyſitian disbelieving her aſſeverations, and particularly that ſhe had her periodical *lochia*, becauſe ſhe looked ſo well, nor had any ſigns of an hydropical Diſtemper upon her, except the tumor of her belly, which being felt, afforded ſome conſiderable ſigns to diſpoſſeſs the Phyſitian of the opinion he had of this perſon; ſeeing it was not a prominent nor roundiſh tumor, nor any ſuch as is uſual in women with child; beſides that, ſhe made not ſuch a coloured and craſſe Urine as Childbearing women are wont to do: Yet there appearing no ſymptoms of a Dropſy, no complaints of the ſtomack, liver, ſpleen, kidneys, no ſwelling of the loins or inferior limbs, no leanneſs in the body or ſuperior parts, no flaccid nor diſcolour'd breaſts, but all being thus far in a good conſtitution; the Phyſitian ſent her away without giving or preſcribing her any Phyſick, putting her in mind of that ſaying, *That the whole need no Phyſitian, but the ſick.* Yet ſhe return'd ſoon after, importuning him to give her his adviſe againſt the Dropſy. He conſulting with other Phyſitians about it, found them as well diſtracted between both as he was himſelf. Yet ſome of them, inclining rather to the opinion of a Dropſy, with appropriate Medicines made her void abundance of water, yet without unſwelling her belly. Whereupon ſhe addreſſed her ſelf to Mountebanks, who voided her purſe without voiding her belly of the water. This made her give over for a while the uſe of all Remedies, committing the whole buſineſs to Nature, and ſo continuing for ſix months. But then hearing of another Hydropical woman that had been cured by her firſt Phyſitian, ſhe return'd to him, with tears in her eyes, beſeeching his aſſiſtance. He now finding her body dryed and bloodleſs, her breath ſhort, her temples fallen in, her noſe ſharp, her eyes hollow, her skin wan and ill-favour'd, her pulſe creeping, her appetite proſtrate, her tongue dry, her voice weak, her evacuations ſparing, and all her ſtrength dejected, in a word, liker a *Sceleton* than a living Body; he calls together divers of his Colleagues, to view this miſerable Creature, who being now ſufficiently convinced of the nature of this Diſtemper, did, though the caſe was now deſperate, reſolve upon the uſe of a *paracenteſis* or inciſion; which the Patient abhorring, ſhe was left to her ſelf, and dyed three months after. Her body being open'd, there ſoon appear'd a great lake of water; whence at firſt it ſeem'd to be a common *Aſcites*, a tumor of waters ſtagnating in the *abdomen*. Then the Liver being look'd after, it was no where ſeen. Next the other *viſcera* being ſought for, *viz.* the Meſentery, *Pancreas*, Spleen, and Kidneys, none of them all appear'd neither, to the aſtoniſhment of all that were preſent, who ſearching further, and meeting with the *Peritonæum*, found it to be turned into a bagg, by a ſeparation made of its interior membrane from its exterior, and ſo encloſing within it the whole bulk of that reſtagnant water, that not a drop of it had been able to get out into the *abdomen*. This coſted no ſmall trouble to render it conſpicuous, by emptying this ſack of all the *Serum*, and ſo diſcovering both ſides of the bagg, made up of the double *peritonæum*, whoſe inner skin had been ſever'd from the outer, ſticking to the tranſverſe Muſcles of the *Epigaſtrium*, the hydropical waters having forced the inner membrane inwards into the hollow of the *abdomen*, and ſo forming it into the ſhape of a bagg, whoſe compaſs reached from the *pubes* unto the diaphragme, and from the left region of the loyns to the right; ſo that the nervous body of the *peritonæum*, being here very thick and cloſe withal, was by little and little expanded, as the capacity of the womb in gravidation is ſtill more and more enlarged. Where it ſeems worth inquiring; Whence this *peritonæum* had acquired this extraordinary thickneſs, being thicker and cloſer than any Oxe-hide, whereas naturally 'tis as thin as any ſilken webb? But to proceed: This bagg of the *peritonæum* being remov'd, the *viſcera* came to view, which were not gravelly, nor tartareous, nor chalky, (as they often are in Hydropical bodies,) but only decayed and colourleſs: Which decay by the timely uſe of an Inciſion might have been prevented.

An Account of three Books.

I. *De SECRETIONE ANIMALI Cogitata*, *Auth.* Guil. Cole *M. D.* Oxon. 1674. *in* 12°.

UPon the conſideration of the Neceſſity and Uſefulneſs of knowing the manner how the *Secretion* of the Juyces in the body is made, both for the preſervation and reſtoration of Health, the Ingenious Author, finding this Argument hitherto but negligently and ſlightly handled, undertakes in this Tract to give us his thoughts of a well-conſider'd Theory concerning it: Having ſuppos'd, *firſt*, that Nature's method is very ſimple, and *alike* in the deſſein of *like* works; *ſecondly*, that the bodies of Animals, and ſo of Men, are fram'd and do work Mechanically; *thirdly*, that nothing is to be aſſerted, which is repugnant to the undoubted *phænomena* of Nature; nor any Uſes to be aſſign'd either to parts or liquors, that do not correſpond with the Oeconomy of the whole Body.

This done, he proceeds to the handling of the Subject it ſelf; and here he explains *firſt*, What he means by this Secretion; *next*, he ſhews the ſource of theſe Secretions, *viz.* the Chyle and Blood; *then*, he eſtabliſhes the Exiſtence of the *Nervous* Juyce, upon which his *Hypotheſis* mainly depends; *further*, he conſiders the previous Diſpoſition of the Juyces for Secretion, which he ſaith is induced by an inteſtin Fermentation; *again*, he aſſigns the Organs by nature appointed for this Office, which to him are none other but the Glandular Subſtances of the Body, to be found in all the parts thereof, even in the Skin it ſelf; *more-over*, he expounds the manner how all animal Secretions are perform'd; which he doth *firſt* in general, teaching that generally they are all effected immediately by *Percolation*; then, in particular diſtinguiſhing Secretions into *Simple* or *Perfective*, and into thoſe that are *Mixt*, and theſe again into *Excretive* and *Reductive*, he affirms the *Simple* or *Perfective* Secretions to be perform'd by *meer Percolation*, whereby, upon a previous mixture of the ferments convening from all parts, the texture of the Juyce is ſo open'd, and its particles ſo comminuted and diſſociated, that any propelling force ſupervening, they will eaſily fall aſunder, and paſs into veſſels ſutable to admit them: By which way he eſteems that the trajection is made of the *Chyle* out of the Inteſtins into the *Milky veſſels,* and that of the *Nervous Juyce* out of the Arteries of the Brain into the *Nerves.* As to the *Mixt* Secretions, he will have them ſo perform'd by a Ferment, as that by means thereof there be impreſs'd ſuch a determination on ſome certain particles of the Blood, that leaving behind others they readily paſs into the veſſels fram'd for Secretion. And here he conſiders, that if this kind of Separation were tranſacted by *meer* Percolation, nothing probably could hinder, but the more ſubtile matter would come away, and the groſſer ſtay behind: Wherefore to procure a receſs of the groſſer parts, he calls in the help of ſome ſuch Ferment, as may precipitate theſe into the Secretory veſſels. On which occaſion he diſcourſes largely of *Ferments,* aſſigning them not only the Uſe of *digeſting* and elaborating the Juyces of the body, but alſo that of *ſecreting* them. Where indeed he takes pains to penetrate into the nature and properties of *Ferments,* minutely examining, What Bodies are qualified for Fermentation; What difference there is in Ferments; and whence the Fermentative power ariſeth; as alſo the Smalneſs of a Ferments proportion to the Body to be fermented, and the neceſſity of ſome warmth to excite Fermentation: Explaining withal the Size and Figures of the parts of Fermenting bodies, which he teaches to be very ſmall, very angular, and exceeding diſſimilar, aſſigning his reaſon for ſo doing. To which he adds the two main Differences he finds in Ferments, ſome having an *Expanſive,* and others a *Precipitating* power; and having rendred the cauſe from whence proceeds this difference, he aſſerts, that Nature makes uſe of the *former* in ſimple, and of the *latter* in mixt Secretions.

After this, he proceeds to ſhew, What it is that Ferments do confer to Secretion, and whence they are derived? As to the *former,* he affirms, that there are *ſome* Ferments, that are precedaneous to Secretion, and able to looſen and ſubtilize the maſs to be fermented, for the more eaſie disjunction of the parts; but that there is an *other,* which immediately cauſeth the very act of Secretion; which he takes to be the *Nervous Juyce,* without the direction of which he eſteems there will hardly be made any actual diſſociation of ſo many different Subſtances, as Nature requires. And this Doctrine of the Uſe of the *Succus nervoſus* in the work of *Secretion* appearing Paradoxical, and, as he thinks, not having hitherto been taught by any, though ſome have long ſince aſcribed to it a *Fermentative* power, and aſſigned to it a conſiderable Uſe in the buſineſs of *Nutrition*; he labors here by ſeveral reaſons to evince the truth of this his new aſſertion. Which done, he paſſes on to deliver his whole *Hypotheſis*, to ſhew, In *what manner* the Secretions in our Body are perform'd by means of this Nervous Juyce.

Here then he ſuppoſeth *firſt*, That, as there is a ready paſſage of the blood out of the arteries into the veins upon the account of a fit poſition of theſe in reference to that motion, ſo there is an eaſie and direct way out of the orifices of the Nerves, inſerted in the Glanduls, to thoſe of the Secretory veſſels: *Secondly*, that theſe veſſels for Secretion are poſited tranſverſly in reſpect to the Sanguiferous, in ſuch a manner that a line, drawn from one of them to the other, decuſſates, (though perhaps not at right angles) the place where the Capillary Arteries diſcharge themſelves into the Capillary Veins.

This done, he conjectures, that whilſt the Blood is permeating the Glanduls wherein the Secretion is to be made, the Nervous Juyce runs continually out of the adjacent Nerves into the current of the Blood, and that, upon irritation, more ſtrongly and more copiouſly; and the ſame Juyce preſently, nimbly, and with a ſufficient *impetus* trajects the ſaid current objected to it, it being both active in it ſelf, and receiving alſo a more vigorous motion from the heat and agitation of the blood. And whilſt this is doing, the minute particles of the Nervous liquor muſt needs in their way hit againſt thoſe groſſer whereof the greateſt part of the Blood conſiſts, which, whilſt they withſtand the direct motion of the *Succus nervoſus*, are by the agility of its parts propell'd, in as direct a line as may be, to the oppoſit ſide of the veſſel wherein they run, foraſmuch as thoſe groſſer ones, being already in motion, do eaſily receive a determination from other particles that are moved more ſtrongly and fall ſidewayes upon them. Now the parts of the Blood being thus protruded, they do, when they meet with the orifices above-mention'd, which go into the Secretory veſſels, paſs nto the ſame without any more ado, if they be of a ſize and figure ſutable to them; if not, they are by the oppoſite ſide retorted into their ſtream, and together with it carried forward. And ſince there is made a continual protruſion of that Nervous liquor out of the Blood, the Brain inceſſantly furniſhing freſh ſupplies, and chiefly at the time when we awake, there is thence a new and plentiful ſtock of ſuch particles conveyed out of the Blood arriving at the Glanduls wherein thoſe Nerves are inſerted, and that ſupply is derived into the Secretory Veſſels; and thoſe particles being conſiderably increaſed, do at length make up a full ſtream.

This is the ſubſtance of the *Hypotheſis*, which the Author endeavours to prove by reaſon, and by the phænomena of ſecretion, as alſo to free from doubts, and to vindicate from Exceptions: Where occaſionally he examins that famous Queſtion, Whether Medicaments work *electivè*; which done, he renders a reaſon of the copious and ſudden making of Urine after large drinking; declaring alſo, How it comes to paſs, that one kind of Evacuation being ſtopt, the matter is not ſeldom carried off another way: treating beſides at large of the Uſe of the *Veſicula bilaria*, as alſo of *private* and *præternatural* Secretions: Concerning all which the Author himſelf deſerves to be conſulted.

II. *Eraſmi Bartholini* SELECTA GEOMETRICA, Hauniæ, *A.* 1674. in 4°.

ALthough theſe Geometrical Tracts were printed *ſeverally* divers years ago, yet they now appear again *together*, under a Title-page of this year; which invites us to give notice of them here, eſpecially ſince formerly but few of any of the *ſingle* Tracts were brought into *England*.

Theſe *Selecta Geometrica* then, (being now to be had altogether at Mr. *Martyns* at the *Bell* in St. *Paul*'s Church-yard,) are;

Firſt, a Tract handling of a General Method to come to an Æquation, by reducing all ſorts of Queſtions to general Heads: Where the Learned Author reduces to one head, *for inſtance*, all Problems of *Proportionals*, both Arithmetical, Geometrical, and Harmonical; but treating here only of the two latter, and more largely of the laſt of all. Conſidering *Geometrical* Propoſitions, and obſerving the *deſiderata* in ſolving Problems concerning the ſame, he propounds a Method, whereby the Solution of ſuch may be found very compendiouſly (*as he ſaith*) and with far greater diſpatch, than hath been done by ſome others, eſpecially the Author of the *Clavis Geometriæ*. The like he undertakes to do, and that more largely, of *Harmonical* Proportions, concerning which he gives us the Demonſtration of *Ten Problems* of that kind, whoſe Truth he had found out by the Method of the *Analyſis ſpecioſa*, thereby to ſhew to the Intelligent, how great a difference there is between theſe two wayes, for ſhortneſs, perſpicuity, pleaſantneſs, and eaſe to the memory. In this piece alſo the Author makes mention of divers things about the *Conſtruction* of Æquations, left imperfect by *Florimundus de Beaune*, which he (our Author) promiſed to publiſh with the Tract that is abroad, and known by the Title of the *Second Part of Des-Cartes*'s *Geometry*; in which indeed he treats *de Natura & Conſtitutione Æquationum, & de Limitibus*, but nothing of the Geometrical *Conſtructions*, either his own, or thoſe that remained imperfect of the ſaid *De Beaune*, mention'd to be in his (our Authors) cuſtody. So much of the *firſt* Tract.

The *ſecond* is his *Dioriſtice*; in which having taken notice, how ſhort the Antient Geometricans came of a General Art of Determining Problems, he ſaith, he hath endeavour'd to ſupply that defect, by delivering here two *General* Rules of Determining the Limits of Æquations, ſo as to know, how many Roots are poſſible: In the firſt of which he follows the Rule of that famous Geometrician *Fermat*: In the *ſecond*, he agrees with the Method of the Learn'd *Huddenius*, to be met with in the *Annexa* to the firſt Part of *Des-Cartes*'s Geometry; which ſeems indeed to be a Corollary of the Excellent *Sluſius* his *General Method of Tangents*, publiſht in *N*°. 90. of theſe Tracts. At the end of this piece the Author promiſeth his *Syſtema Matheſeos Univerſalis*, where he would have the Reader expect a large account of all things belonging to the *Analyſis ſpecioſa*, both as to Precepts and Examples: Which promiſe 'tis hoped will be made good by him ere long.

The *third* is an *Auctarium Trigonometriæ*, to ſolve and demonſtrate Triangles both Rectilinear and Spherical; deliver'd in XIII. Propoſitions, of which he ſhews the laſt of all to be of great Uſe in Tables Aſtronomical compoſed after the manner of the *Rudolphin* made by *Kepler*, where the Diſtance of the Sun from the Earth, as alſo from any other Planet, is expreſt in Logarithmes.

garithmes. For, to find the *Proſthaphæreſis* of the Orb, he there teaches, that you are to reſolve a *Triangulum ſimile*. But now, though the Logarithmes of the ſides of a Triangle be given, yet there is not given the *ratio* of the *Summ* of the ſides to their *Difference*; which is made known by the ſaid 13th *Problem*, here demonſtrated.

III. *LOGICA, ſive ARS COGITANDI, è Tertia apud Gallos Editione recognita & aucta, in Latinum verſa. Londini impenſis* Joh. Martyn, *ſub ſigno Campanæ in D. Pauli Cœmeterio*, 1674. *in* 8o.

THis Logick, being now turned into good Latin, ſeems worthy to be recommended to all young Students, as paſſing by, what is uſeleſs and pedantique, and comprehending what is indeed ſober, and neceſſary to direct our Reaſon in all ſorts of ingenious and uſeful Sciences.

It conſiders chiefly, what the Cauſes are, from whence ſo many Errors take riſe, and how it comes to paſs that we are ſo far miſled in the inveſtigation of Truth.

It regulates our firſt *Apprehenſion* of things; it confines our *Judgment* and *Diſcourſe* to what is clearly and diſtinctly underſtood; and it orders the Mind to diſpoſe its *Ideas* and Ratiocinations in ſuch a *Method*, as is moſt ſutable and proper for the Explication of any Subject under conſideration.

Moreover it endeavors to ſhew, that the *Ten Ariſtotelian Predicaments*, which the Schools hitherto have born themſelves ſo much upon, are ſo far from being of that uſe they lay claim to, that very often they are an obſtacle to the attainment of ſolid knowledge; which the Author Attempts to evince; 1. Becauſe that thoſe *Predicaments* are recommended to Scholars as founded in reaſon & truth it ſelf, whereas nothing is more arbitrary than they are, as proceeding from the imagination of ſome one Man, who had no right at all to preſcribe Laws to the Philoſophical World; others having no leſs power than *He* to uſe their right in diſpoſing the Objects of their thoughts in ſuch order as ſutes beſt with the Model of Philoſophy which they embrace; upon which account very many of thoſe that diſſent from *Ariſtotle* find more cauſe to adhere to the import of theſe two Lines;

Mens, Menſura, Quies, Motus, Poſitura, Figura,
Sunt, cum Materia, cunctarum Exordia rerum:

They being fully perſuaded, that the *Seaven* Heads, herein contained, have a real foundation in Nature, and do altogether exhauſt the ſame. 2. Becauſe that this applauded Series of *Predicaments* induces many men to take up, and acquieſce in the empty Shells and Barks of Words, inſtead of ſincere and good Fruit, they caring for little elſe ſo they can but reckon up ſome fine Words of an arbitrary ſignification, that do not imprint any clear and diſtinct *idea* in the Mind.

Further, this Logick delivers not bare Rules with trivial and nauſeous Examples, but having laid down ſolid *Precepts*, it preſently transfers them to very good *Uſe*, and accommodates the ſame to very Inſtructive and Delightful Examples, taken out of all ſorts of real Sciences, whereby they are ſo faſten'd in the Memory, that there they ſtick even after the Students have laid aſide Books of Logick: So that here may be found both *Rules* of good Logick, and the *Uſes* of thoſe Rules; which muſt needs have this excellent Effect, that by the help of ſuch a Logick as this, ingenious Scholars will be enabled to Judge of Sciences; and the Sciences, by way of recompence, will fix Logick the deeper in their underſtanding.

Upon occaſion, notice is taken by our Author of what is conſiderable in *Ariſtotle*'s Logick, and what other Writings of his are valuable; from which number he ſcruples not to exclude his *Phyſicks*, boldly affirming, that they partly teach what's falſe, partly nothing but what we can *not* be ignorant of. Where he alſo declares in general, that ſince we owe no deference to any Philoſophers, but either upon the account of Truth they have endeavour'd to diſcover, or upon conſideration of the eſteem they have gain'd in the Learn'd orb, we cannot be obliged further to venerate *Ariſtotle* than he hath attained Truth, nor pay him honor for the Tenents deliver'd by him and his followers, more than to any other part of the Learn'd World that labor in the ſearch of Truth, and find cauſe to diſſent from Him.

When our Author comes to treat of *Ratiocination*, he adviſes his Reader to conſider; Whether he ought to ſet ſo much by the Forms of *Syllogizing* as hath been done hitherto; and Whether moſt Errors that entangle men, do not ſpring from thence, that they build their Diſcourſes upon *falſe* Principles, rather than they deduce illegitimate conſequences from *true* Principles; it hapning but ſeldom, that we are impoſed upon by ſuch a Ratiocination as is therefore only unſound, becauſe 'tis made up of ill-drawn Conſequences; and it being alſo certain, that he that is not able to diſcover ſuch vices by the ſole Light of nature, will neither be able to learn and apply theſe Rules that are taught to detect them.

Proceeding to deliver the Rules of true *Method*, he firſt recommends the four celebrated ones left by *Des-Cartes* in his *Diſſertation de Methodo*, as very uſeful to avoid Error in the acquiſition of Sciences; and then he repreſents with an high *encomium* the way uſed by Geometricians for Demonſtration, compriſed in theſe *five* Rules;

1. *Nihil in terminis obſcurum & æquivocum relinquere, quod non definiatur.*
2. *In definitionibus terminos uſurpare vel perfectè notos, vel priùs explicatos.*
3. *Nullum axioma ponere quod non ſit evidentiſſimum.*
4. *Omnes Propoſitiones ſub-obſcuras probare ope Definitonum præmiſſarum, Axiomatum conceſſorum, Propoſitionum demonſtratarum, vel denique ipſâ rei, de qua agitur, Conſtructione, ubi quid* faciendum *proponitur.*
5. *Nunquam abuti terminorum Ambiguitate, non ſuffectis, ſaltem mentaliter, Definitionibus, quæ illos reſtringunt & explicant.*

Yet to this Method he ſubjoyns an Advertiſement concerning ſome Defects that are obvious even in that Method of Geometricians; of which he enumerates theſe ſix: 1. *Magis laborare de Certitudine quàm Evidentia, déque Intellectu convincendo quàm illuminando.* 2. *Ea probare quæ probatione non egent.* 3. *Demonſtrare per impoſſibile,* h.e. *non per propria rei principia, ſed per aliquod, ſi res aliter ſe haberet, inde ſecuturum abſurdum.* 4. *Demonſtrare per aliena & remota.* 5. *Non obſervare rerum ordinem.* 6. *Non adhibere diviſiones & partitiones.* All which how 'tis made out by Inſtances, may appear in the Book it ſelf.

Some Animadverſions upon the *Latin* Verſion, made by *C. S.* of the *Phil. Tranſactions* of A. 1665. 1666. 1667 1668; printed at *Amſterdam* by *Henry* and *Theodore Boom*: Which Reflections ſince they chiefly concern Forraigners, it was thought moſt proper to give them here in *Latin.*

NON ſine gravi ægritudine animi, operam, illi, quæ No. 75. *p.* 2269. *horum opuſculorum extat, geminam denuò ſuſcipit eorundem Author* Anglicus; *eáque tantò graviori, qvòd vix id fieri ab eo poſſit ſine offenſione viri, cujus alioquin eruditionem æſtimat. Non una equidem ratio ipſum adegit ad injucundam hanc provinciam denuò ſubeundam; cùm non privata duntaxat ſua, ſed ipſiſſima* Societatis Regiæ *exiſtimatio id depoſcat.* Etenim, *ut à poſteriori exordiar, perperam omninò Verſionem hanc Latinam ornavit Interpres, vel Bibliopola, vel uterque, falſo illo Titulo,* Acta Philoſophica Societatis Regiæ, *cùm manifeſtò aſſuantur hæ voces* (Societatis Regiæ) *quæ in* Anglico *Opere nequaquam extant; cúmque tantùm abſit,* Acta *hæc dici poſſe* Societatis Regiæ, *ut* plæraque *potiùs, (nè dicam* omnia) *in his Opuſculis comprehenſa, Acta ſint virorum particularium, tum* extra *tum* intra *Angliam philoſophantium; cùm denique fidem poſſim appellare interpretis, me ſatìs maturè diſertis litteris eum monuiſſe, neutiquam ea eſſe dictæ Societati tribuenda, utpote quæ non modò nihil eorum compoſuerit, ſed & conſcribendis hujuſmodi Miſcellaneis dignitatem ſuam proſtituere dedignetur: Quibus accedit, quòd ipſæ Authoris* Anglici *Dedicationes quibus opuſcula hæc, diverſis annis edita, tum laudatæ Societati, tum Nobiliſſi-*

mo ejus Præſidi,aliiſque Angliæ Primoribus, *expreſſo ſuomet nomine*, *inſcripſit*, *abundè teſtentur*,*non* Societatem,*ſed* è Societate *unum*, Henricum *ſc.* Oldenburgium,*Tractatulos hos compoſuiſſe & evulgaſſe,qui & aliquoties in ipſiſſimis hiſce Actis*,Num.*ſc.*12.*p.*213.Num.86. *p.* 5047, *&c.falſam hanc opinionem, quæ Societati Regiæ hæc Exercitia adſcribit, refutatum ivit.*

Atq; hoc primum eſt & palmarium, quod monendus erat Lector. *Nec tamen ſecundo loco diſſimulandum,Verſionem ipſam* Editioni Anglicæ *graviter eſſe injuriam, quandoquidem illa non tantùm inſipidâ phraſeologiâ* Latinâ *paſſim laborat,ſed & ipſum Autographi ſenſum non raro convellit.Quod nè gratis dictum putet* Lector,*primum hujus verſionis opuſculum hîc examinabimus, ut judicare ex eo quilibet de cæteris poſſit, quæ hîc perſtringere nec libet nec vacat.*

Et primò quidem in ipſa Dedicatione, *quâ* Soc. Regiam *compellat Author Anglicus, hæc noto* :

P.1. *l.* 10. Vindemiæ *pro* ſpicilegia; *prius enim ſignificat* Vintage, *cùm in Angl. ſit* Gleanings, *cujus Latinum eſt*,Spicilegia.*p.*3.*l.*3.radiis *pro* ſtricturis; *Anglicum enim eſt*,glimpſes,*non*,rays.*ib.l.*11.*& ſeqq.non reddidit ſenſum Authoris : periodus enim illa,prout eam vertit interpres,innuit,quaſi hæc opuſcula continerent ipſa* Societatis *conſilia,cùm tamen Anglica editio nil aliud velit nec ſonet, niſi*, Curæ eſſe Authori,ut,quemadmodum fidem ſuam probare debet conſiliis,quæ R.Soc.ipſi committit,ſic otii,quod eidem indulget,nulla minuta inutiliter decoquat.*Porrò,quales ſint hæ dictiones Latinæ, judicet peritus Lector,ſc.*Intimationes amplarum compilationum ; *it.*proſecutiones; *it.*beneficium recipere;*it.*erigere univerſalia ſtudia,*&c.pro quibus in promptu erat dixiſſe* ; quæ digitum intendunt in volumina ampliora;conatus & labores;beneficium percipere; univerſalia ſtudia conquirere, *vel ſimilia magis Latina.*

In Introductione *Operis hæc occurrunt* : *Ipſa prima periodus tota nauſeam parit.Adhæc p.*2.*l.*13.*voc.*Improvement *vertit* perfectio, *cùm tam immane ſit inter illa duo diſcrimen,ac inter* viam *&* metam:*Eſt enim* improvement,*augmentum*, *incrementum*, *& niſus ad perfectionem,non ipſa perfectio. p.* 3. *l.* 7. ingenioſa ſtudia diligantur,*pro*,ingeniis ſtudiis animi addantur ; *eſt enim in Angl:* cheriſhed,*non*,loved. *Ibidem habetur*, verſantes in talibus rebus , *pro*, talium rerum ſtudioſi, *&c.*

In ipſo Opere, *p.*3.*l.*18.*de* perfectione Teleſcopiorum, *pro*, de Teleſcopiis ad majorem perfectionem adductis. *Injuria inſignis Authori infertur* , *dum Lectori Latino hunc ſenſum ingerit Interpres*,*ac ſi* perfectionem *attigerint Teleſcopia machinamento hîc tradito*, *cùm tamen non-niſi* incrementum *rei Teleſcopicæ indicet Author. ib.*concernens perfectionem, *pro*,de conatu Teleſcopia perficiendi. *p.*4.*l.*9. parva Teleſcopia ſecundùm proportionem meliora eſſe ad viſendum in terram, quàm magna,*pro*,Lentes minores,habitâ proportione,in objectis ſuper terram viſendis,majoribus præſtare. *Et hujus paragraphi reliquum Angliciſmis ſcatet.ib.l.*15.ſine inventione variarum iridum,*pro*,nullis coloribus iridis apparentibus : *Non intellexit vim phraſeos Anglicæ interpres. p.*5.*l.*3.7.15. ſtriis, *pro* ,zonis *ſeu* faſciis. *ib.l.*19.intervallo circiter dimidium diametrum Jovis, *pro*, intervallo circitér longitudinis ſemidiametri Jovis ; *eſt enim hoc loco* circitér *non præpoſitio*, *ſed adverbium. p.*6.*l.*23.geſtiebat,*&c. perperam hæc periodus verſa*,*pro*, cui viſum fuit,ut par Exemplarium

Soc.Regiæ,aliud Principi Palatino Ruperto,reliqua aliis nonnullis,qui ſc.apud exteros ſingulari ſua in philoſophicis ſcientiâ inclaruerant,exhiberentur. *ib. l.*16.Virtuoſi,*pro*,illuſtres:addito ſermone,*&c.pro*,innuens,nunquam tale quid hactenus à quoquam Aſtronomorum occeptum fuiſſe.*p.*7.*l.*2.Hîc itaq; exhibet,*pro*,cùm ipſe è contra exhibeat; *eſt enim hæc ſequela , pars illius ſermonis, quem Auzoutus inſtituit apud Regem.ib.l.6.*niſi ejus nimia remotio,aut appropinquatio ad Solem ab oculis noſtris eum abſconderet, *pro*, donec nimia ejus diſtantia, vel propior Solis ad nos acceſſus, oculis noſtris eum ſubducerent. *ib.l.8.9.*23.24. Deſcendens ad particularia; hæc ſtella libera exiſtens;Æquatorum circiter 45½ g;Eclipticam 28.gr.Ariet; *qualis,quæſo,hæc Latinitas? pro*, ubi Author pergit ad particularia; ſtella hæc ex radiis Solis eluctata;Æquatorem ad 45½ gr;Eclipticam ad 23 g.*&c. p.*8.*l.*3.continuaturum ita moveri, *Latinè,porrò ita meaturum,vel in iſto motu perrecturum. p.9.l.6.*appropinquaturum parvæ ſtellæ Ceti,paulò intra viam ejus ſitæ,*pro*,ad parvulam in Ceto ſtellam,viæ ſuæ objectam,paulò inferius,quàm proximè acceſſuram. *ib. l.*26. 27.*non intellexit vim dictionis Anglicæ interpres,quæ ſic reddenda Latinè*;quod ipſum ceu notatu perdignum ſedulò obſervatum cupit. *p.*10.*l.*7.ad min. diſt. *pro*,in min.diſtantia. *ib.l.*19.20.Caudam Cometæ occidentem versùs, inclinantem Septentrionem versùs;*Latinùs & citra nauſeam quis dixiſſet*,Cometæ caudam occaſum versùs , cum aliqua ad Septentrionem inclinatione. *p.* 11. *l.* 20. *fuiſſe ſine refractionibus ; iterum vel non aſſecutus eſt , vel perfunctoriè legit , verba Anglica ; dicendum enim* , ubi futurus fuiſſet ſine refractionibus, *vel Latinius*, refractionum immunis. *p.*12.*l.*18.ſtellæ progreſſæ fuerint medio tempore conſtructionis globi,*pro*, progreſſæ fuerint ex eo tempore,quo globus fuit conſtructus.*Planè jejuna eſt verſio hujus periodi,nec non periodorum ſequentium hujus paragraphi. p.*13. *l.* 10. philoſophici prophetæ , *pro*, philoſophici vatis. *ib. l.* 11. 12. *qualis Latinitas* , declarat ſe paratum eſſe addiſcendo aliam hypotheſin ; *quàm erat in proclivi dixiſſe!* ſe paratum ad aliam hypotheſin diſcendam, *vel*, ſe aliam hypotheſin promptè amplexurum,*etſim. ib.l.*19.*non intellexit vim vocum*, in order, *quæ volunt,non,ut ipſe vertit*,ſecundùm Experiment.hiſtoriam, *ſed*,comparata ad condendam hiſt.Experimentalem.*ib.l.*22.*etſeqq.Tota hæc periodus inſulſè adeò verſa eſt,ut aures veræ Latinitati aſſuetas vehementer offendat : Quis ferat vocem*, obligantiſſimè ? *p.* 14.*l.*1.Corpora quæ poſſunt efficere ut alia congelent,*pro*,ut congelentur,*vel*,quæ congelare alia valent.*ib.l.*4.quæ poſſunt congelare,*pro*,quæ comparata ſunt ad congelaſcendum. *ib. l.*6. quæ non poſſunt congelare,*pro*,quæ inepta ſunt vel non comparata ut congelentur. *ib.l.*9.circa tendentiam,*Latinè*,circa niſum *vel* conatum. *ib.l.*13. frigore, *pro*, vi frigoris inductam. *ib.l.*19.Experimenta in ſocietate ; *quis ferat hæc verba, pro dictione hac Angl.*Experiments in conſort; *dicere Latinè potuiſſet*, Experimenta ſociata. *ib.l.*25. congelatæ,*pro* congelaſcentis. *p.*15.*l.*21.conſilia *pro* cogitata.*p.* 16.*l.*14.*non intellexit vim dictionis Anglicæ,quam vertit*,Lanius curavit vaccam tegi,*pro*,iniri à tauro. *p.*17.*l.*14.uſum pro probationibus, *Latinè*, uſum in probationibus beneficio catini inſtituendis.*p.*18.*l.*2.3.ſi fortè occaſio offerretur mittendi pro acquiſitione ejus : *Cujus, quæſo, aures non offendantur hac phraſeologiâ. p.*19.*l.ult.*imperceptibilem,*pro*,mirandam.*p.*22.*l.*1.2.3.concernens ſucceſſum horologiorum pendulorum mari pro longitudinibus: *Et quis hanc ferat Latinitatem? quin & ſeq.l.9.*eminentium Virtuoſorum,*it.l.*20.navigaſſet ſuper hac linea. *p.*23.*l.*27.pendulorum globulorum,*pro,* Horologiorum pendulis oſcillatoriis inſtructorum. *ib.* ſpem & deſiderium meum ſuperantem;*addit interpres de ſuo voc.*deſiderium,*quæ futilis eſt additio.p.*25.*l.*19. ingenium tam amplæ extenſionis,*Latinè,*ingenium adeò capax.*p.*27.*l.*23.ad ſuſtentationem harum qualitatum;*quem non ſubeat nauſea? pronum erat dixiſſe*, præter illam ingenii vim & præſtantiam, quæ requirebatur ad magni hujus nominis magnæq; virtutis menſuram implendam.

*Piget ſanè tædétq; plura indicare.Percurrens interim nonnulla eorum quæ ſequuntur in hac verſione,video,p.*29.*l.*29.*poni* Teleſcopiorum *pro* Microſcopiorum. *p.*30.*l.*18.mihi jus illud tribuent, *pro,*qui quod meum eſt mihi tribuent. *p.*38.*l.*26.27.dilutione, *pro,*lotione. *p.*40.*l.ult.* deducantur arbores, *pro, devehantur. p.*44.*l.*8.duo acervi,*pro,*binus proventus.*p.*45.*l.*7.res quædam in tantum parva,*pro,*adeò exilis.*ib.l.ant.*pennis reſultantibus,*pro,*Elaſticis.*p.*48. *tota hæc pag.ſcatet Anglicismis. p.*49.*l.*16.perget offerendo,*pro,*pergit offerre. *p.*50.*l.* 15.19.in corpore,*pro,*intra corpus. *ib.l.*28.ſpiſſitatem, *pro,*denſitatem. *p.*51.*l.*13.14.15.*abſona verſio! ib.l.*28.inæquales leges;*ita vertit Angl.*odd laws, *non aſſecutus ſenſum voc.*odd,*quod hîc ſignificat* enormes,heteroclitas.*p.*52.*tota verſio eorum,quæ de Machina Teleſcopica hîc habentur, inepta eſt.*

Evolvens obiter Verſionem N.16.*incidi in bene multa,quæ notam ſanè merentur,videl.p.* 194.*l.*19.optimè concedi poteſt,*&c.non aſſecutus eſt vim phraſeologiæ Anglicæ, quæ hoc vult,*id facilè condonandum Authori.*p.* 195. *l.* 15. quæ mihi loco magni mandati eſt; *quàm inſulſa latinitas? dicendum,*cui ceu gravi mandato obtemperandum judico.*ib.l.*23 adeſſe proſecutioni,*pro,*vacare *ib.l.*26.rationes, quibus mihi perſuaſiſti ad minimùm aliquid conſcribere,*pro,* quibus inducor, ut ſaltem aliquid hujuſmodi præſtem. *p.* 147.*l.*4.quæ præſervetur ad proſecutionem aliorum,*pro,*quicquid de me fiat,ab aliis fortè merebitur promoveri.*p.*198.*l.* 12.de æſtibus altiſſimis*&c.hæc periodus ſic vertenda,*circa Novilunia & Plenilunia contingunt Æſtus ſive Tumores maximi altiſſimíq; minimi autem circa Quadraturas; & temporibus intermediis ſervatâ proportione. *p.*200.reducetur ad libellam Horizonti,*pro,*ad libramentum.*p.*201.*l.*7.*etſeqq.Tota hæc periodus ſic reddenda:* Jam ſi intelligatur Terra nonniſi uno horum motuum ferri, ídq; æquabili velocitate;Aqua,ubi ſemel nacta fuerit parem impetum, pari cum Terra paſſu procederet; quippe nulla daretur occaſio, ob acceleratum vel retardatum motum in contigua Terræ parte,cur vel reſiliendo vel proſiliendo incumbens Aqua in aquam vicinam accumularetur.Quoniam verò cujúſq; in Terræ ambitu particulæ Verus motus ex duobus componitur,Annuo ſc.& Diurno (quorum quidem Annuus in BEC eſt quaſi triplus,juxta *Galilæum*,Diurni in Terræ Circulo maximo,ut DEF;) Dum punctum aliquod ſuperficiei Telluris circa ipſum Centrum B movetur à G ad D & E,utráq; ipſum B centrum promovetur ad C; vera expoſiti puncti promotio, (ſeu motus in præcedentia) ex utróq; componitur,puta ex motu B ad C, atq; G ad E. Dum verò G promovetur per D ad E, E retro-fertur per F ad G,motu contrario illi, qui fit ex B ad C; adeóq; vera promotio puncti E non eſt niſi differentia ipſorum BC & EG. (Nam,præter motum ipſius B ad C circa centrum A [*quæ poſtrema vocabula,* circa centrum A, *ſubſtitui debent pro illis,* ſuper centro; *quæ,non Interpretis, ſed Typographi culpæ debentur,*] punctum G porrò promovetur quantum eſt à G ad E, & retro-fertur punctum E,quantum eſt ab E ad G.) *&c. Cæteris,quæ nimis multa ſunt, perſtringendis locus deeſt.*

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*Errata in Num.*105. Pag.99.l. 52.r. *circumvolutionum.* p.118.l 23.r.*unchanged in the Urine.*

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Numb. 107.

PHILOSOPHICAL TRANSACTIONS.

Octob. 26. 1674.

The CONTENTS.

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An Obſervation made by the Learned Dr. Sampſon *of a Man Anatomiſed, whoſe Bowels were found inverted.*

MR. *J.D.* ſometimes a Miniſter in *Yorkſhire*, was troubled with a Cough, and other Miſchiefs; for relief againſt which he took a journey to *London*, and that, for the moſt part, on foot: He lived not above a fortnight after he came up. In his Sickneſs he was much addicted to drink Brandy, which haſtened his death. I opened his Body with the aſſiſtance of two other Phyſitians, Dr. *CL.* and Dr. *M.*

We obſerved his Limbs to be much macerated, his Belly was ſwelled with ſome inequality, eſpecially in the tract of the right Muſcles: A conſiderable quantity of water was taken out of it; His Guts inflamed, and extended with wind; his Gall very viſcid; his Lungs inflamed, and beſet with divers glanduls. But that which moſt of all ſurpriſed us, was the Inverted order of his Bowels: His Liver, which was very large, lay in the left hypochondre, and his Spleen in the right; the Cone of his Heart was on the right ſide, and accordingly, the larger and thinner Ventricle was found on the left; and the thick one, which in others is on the left ſide, was in him on the right. The *great Artery* deſcended on the right ſide, and the *Vena Cava* aſcended by his Liver on the left. The *Oeſophagus* deſcended to the firſt orifice of the ſtomach on the right ſide, which made the *Pylorus* and Entrance of the *Pancreas* be on the left, and the firſt flexure of the ſmall Guts to be towards the right: So that the beginning of the *Colon*, with it's *appendicula*, lay at the left *Os iliôn*, and the *flexura Sigmoïdæa* towards the right. Other things, that neceſſarily followed this ſite, need not be mentioned.

It was not thought on to enquire, on which ſide the *Lacteons Thoracic ductus* aſcended or where it ended; nor, on which ſide the recurrent Nerves took their places of returning about the trunks of the great Artery and the Axillary; nor had we time to do it.

This Perſon was never obſerved in his life time to have any diſtemper, or uſage, which might diſcover this inverted ſituation of his Bowels, nor had this contrapoſition any evident influence upon his Diſeaſes and Death. He was about thirty years of Age, a married Man, had ſeveral children, was of a middle ſtature, healthful till toward the latter end of his time: Had no prominency on his left ſide, more than the other; was not left handed, nor had any weakneſs on his left ſide.

Diverſe other things were obſervable as to his diſeaſes, which are here omitted.

So *far this Obſervation*; to which the Obſerver adds, that ſome like, though none ſo compleat, Inſtances of inverted Bowels are mentioned by the famous *Bartholin* in his Second Century of Obſervations, *n*. 29. from the hand of Monſieur *Patin A.* 1650. at *Paris*; and from Signor *Pietro Servio A.* 1643. at *Rome*: And that *Schenikius* mentions two others, *l*. 3. *Obſ*. 9. *de jecore*; one found by *Gemma*, another by *Aqua pendente*.

An Account of the two Sorts of the Helmontian Laudanum, *communicated to the Publiſher by the Honourable* Robert Boyle, *together with the Way of the Noble Baron* F. M. van Helmont *(Son to the famous* Johannes Baptiſta,) *of preparing his* Laudanum.

—AS for the *Helmontian Laudanum*, you may uſe your own Liberty in ſuſpecting the Receipts that go about of it. For the name it ſelf ſeems ambiguous to me, who am well inform'd that there are two ſorts of the Helmontian *Laudanum*; the one us'd by the elder *Helmont*, the other by his Son. The former was as a great Secret communicated to me by an expert Chymiſt, ſent by a German Prince to Complement *Johannes Baptiſta Van Helmont*, ſome of whoſe Manuſcripts (one of which periſh'd in the fire of *London*,) he procured together with a way of making his *Laudanum*, which, having receiv'd from him fourteen or fifteen years ago, I carefully prepared, and thought my labour ſo well recompenſed by the extraordinary Operations it had, not ſo much in my hands, as thoſe of Learned Phyſitians and others, to whom I preſented portions of it, that I ſhould have thought the Chymiſt a Benefactor to Phyſic, if he would have made publique, or permitted me to publiſh the way of making ſo ſucceſsful a Medicine. And thô the acceſs to my Laboratory was ſo free to Ingenious men, who knew ſuch a Medicine to be preparing there, that ſome of them might eaſily ſuppoſe themſelves Maſters of the Secret; yet my juſtice to the Communicator, who made a great and deſerved benefit of the *Laudanum*, made me take that care to conceal ſome Circumſtances, that men may eaſily be, much more *confident* than *ſure* that they have the right way of making the Medicine. Which becauſe I durſt not communicate, meeting two years ago with that Obliging and very Ingenious Perſon, *F. M.* Baron *Van Helmont*, Son to the famous *Johannes Baptiſta*, I obtain'd from him, by word of mouth ſome Directions about the *Laudanum* he uſes, which tho he confeſs'd, and I ſoon perceived, to be differing from his Fathers, yet he ſeem'd to think it not inferiour and more parable. But he having, for a certain Reaſon, imparted to me his proceſs only by word of mouth; leſt it ſhould ſlip out of my Memory, I ſoon after committed it to writing, as the particulars I gather'd from his writing occurr'd to me; and at the next Seaſon caus'd the Medicine to be prepar'd in my Laboratory, where the progreſs was often watched in my abſence by a very Learned and Induſtrious *London* Doctor, who having at my requeſt made many Tryals with it, and ſome in caſes where other *Laudanums* had been found unavailable, both uſes it, and commends it more than I could expect from ſo wary and judicious a man. This Medicine being ſomewhat more cheap and eaſie to be made than the Elder *Helmonts*, the experience of its efficacy made me deſire of the Younger a permiſſion to communicate it for the publique good, and to prevent thoſe ſpurious Receipts that go about of the *Helmontian Laudanum*: which Requeſt of mine being almoſt as ſoon granted as made, I think my ſelf bound both to own his readineſs, to oblige the publique, and to acquaint them with *His* way of making ſo conſiderable a Medicine, as I practiſed it; tho, if I had receiv'd his Directions in writing, they might have been more full and methodical. But though I perceived, that he ſometimes a little varies his Preparations; yet that Laudanum proving very ſucceſsful, that was made according to the annexed Paper, I think it will not be amiſs to keep to that: Which I wiſh could have been publiſh'd before the ſeaſon of the Quinces were ſo far advanc'd. And I ſhall the more hope it may come abroad before it be quite too late, if you pleaſe to afford it room in the Papers, wherewith I am inform'd you intend this week to gratifie the Curious:

Laudanum Helmontii Junioris.

Take of *Opium* a quarter of a pound, and of the Juyce of *Quinces* four pound at the leaſt *; the Opium, being cut into very thin ſlices, and then as 'twere minc'd to reduce it into ſmaller parts, is to be put into, and well mix'd with, the liquor, (firſt made luke-warm) and fermented with a moderate Heat for eight or ten dayes, rather more than leſs; then filter † it, and having infus'd in it of Cinamon, Nutmeg and Cloves, of each an ounce ||, let them ſtand three or four dayes more, if it be a full week it may be ſo much the better; then filter * the liquor once more, having let it boil a Walme or two after the Spices have been put in: This being done, evaporate away the ſuperfluous water to the conſiſtence of an extract, or to what other conſiſtence you pleaſe.

* (For near five pound would perhaps do better)

† (which Circumſtance the Author often omits, tho I do not)

|| (the Author ſome times uſes half an ounce more of each Spice)

* Or ſtrain it well through a Canvas Bag.

Laſtly, incorporate very well with it two, or at moſt three ounces of the beſt Safron reduc'd to fine † powder.

† (Some times the Author inſtead of the Powder makes uſe of as much extract as can be obtain'd from that quantity of Safron.)

According to the conſiſtence you deſire to have your Medicine of, you may order it ſo, as *either* to make it up into a Maſs of Pills (in which form I have caus'd it to be given,) *or* keep it in a liquid form; but in this later caſe the Evaporation muſt have been made more ſparingly, that after the putting in of the † Safron it may not grow too thick. In this form the doſe may be from five or ſix drops to Ten, or fewer, according to Circumſtances; and of the pills a ſomewhat leſs quantity is required.

† (or its extract.)

A Diſcourſe denying the Præ-exiſtence of Alcalizate *or Fixed Salt in any Subject, before it were expoſed to the Action of the Fire: To which is added a Confirmation of an Aſſertion, deliver'd in* Numb. 101. *p.* 5. §. 6. *of theſe Tracts,* viz. *That* Alcalizate *or Fixed Salts extracted out of the Aſhes of Vegetables, do not differ from each other: The ſame likewiſe affirm'd of* Volatil *Salts and* Vinous *Spirits; by the Learned Dr.* Daniel Coxe.

THE *Alcalizate* or *Fix'd* Salts of Plants, extracted out of their Aſhes after Incineration, or out of Tartar calcined, do, in my apprehenſion, neither *præ-exiſt* in the Vegetables that afforded them, before they were expos'd to the action of the Fire; nor do they differ *conſiderably*, (I am certain, not *ſenſibly*) from each other.

The *former* part of this Poſition may be thus made out:

1. I never yet found, that any Vegetable (or indeed Animal, or Mineral) ſubſtance did in the leſt meaſure manifeſt to the Taſt, or by its Effects, that it contained any ſuch Salt. Many Plants and Roots, lightly bruiſed, affect the eyes and noſe after the manner of *Volatil* Salts, and ſeveral do bite the tongue, and ſtrike upon the palat. Some herbs yield a copious Volatil Salt immediately after they are preſs'd by a conſiderable degree of heat: And many ſorts of Earths do abound therewith; ſo that it is highly probable, they do often actually exiſt in Vegetables, in the very ſame form, wherein they appear unto us upon diſtillation from the Herbs themſelves, or from Soot. And that *Acid* Salts do really exiſt in many Plants, is diſplay'd by their Taſts and Effects. They may alſo be obtain'd *without* fire or any artificial *Analyſis*; as is evident in Tartar, and the reputed Eſſential Salts of many Plants; in Verjuyce, Vineger, and Verdegris, whoſe Acidities may be concentred, and made to appear in a dry form. Now did *Alcalies* exiſt in the Plants before the *Analyſis*, eſpecially ſo copiouſly as they ſometimes appear afterwards, certainly they would betray themſelves by ſome

viſible ſenſible property, or other ſymptom of their preſence.

2. Did *Alcalies* præ-exiſt in Plants, probably Animals, whoſe ſole food they are, would alſo abound therewith; whereas on the contrary we do not find the leſt footſteps thereof either in Blood, Urine, Bones, Horns, &c. which do all abound with *Volatil* Salts; nor in ſome other parts, Excrements, and Juyces, that afford ſtore of Acidity, which may frequently by coagulation be brought to a Saline form or conſiſtence. Nor can it reaſonably be pretended, that the Ferment of the Stomach and other parts, ſeveral Digeſtions and repeated Circulations, have alter'd its property, and at length rendred it Volatil. For, *firſt*, Alcalies ſeem to be of a very fixed nature, and are not eaſily volatilized: And daily experience will evince, that the Chyle doth not in the leaſt participate, either in taſt, or any other property, with Alcaliſat Salts. Beſides, Herbs taken out of the *Omaſus* of ruminating Animals, without any further digeſtion or preparation yield a Volatil Salt when fermented or putrified in the open air, without additament.

3. Moſt Vegetables, whether Woods or Herbs, if burnt whilſt they are green, and with a ſmothering fire, yield Salts which are far enough from Alcaliſate; being either Neutral or Acid, or, to ſpeak more properly, Tartareous: For, they do almoſt exactly reſemble purified Tartar; and diſtilled yeild the very ſame ſubſtances. Indeed, ſome few Herbs, ſuch as *Satureja*, *Roſemary*, &c. which abound with a ſprightly volatil Oyl, if they are well dried, upon ſimple incineration yeild an Alcaliſate Salt: So do ſome dry Woods. But, that they are produced by the Fire, and not ſeparated, I ſhall anon prove from Experiments, I think, unqueſtionable and unanſwerable.

4. In the moſt natural method of analyſing Plants, which is by Fermentation or Putrefaction without additaments, or the intervening of a ſuſpicious Analyſer, we receive Oyl, Acid Spirit, and Volatil Salt copiouſly; all which did evidently præ-exiſt. But, if the Herbs are perfectly or intirely putrified, little or no *Alcali* can be extracted from them; as

neither from rotten or putrified Wood; the active Salts, by whoſe combination the Alcali is produced, being either expired or evaporated.

Next, I am to enquire, How the Fire produces this *Alcali*: Whether by the changing of one ſingle præ-exiſting principle; or by enabling any among them to make ſo notable an alteration upon or in the other; or laſtly, Whether it is effected by the Union of two or more active principles, which thereby become different from what they were before the ſaid Combination?

I ſhall not at preſent trouble you with the Reaſons, Experiments, and Obſervations, which have induced me to reject the former; but, briefly ſuggeſt thoſe, which incourage and diſpoſe me to believe and aſſent unto the latter: So that this is my Poſition; That, *Alcali Salts do reſult from the Combination or Union of the Saline and Sulphureous Principle.* But, whether it is the *Volatil* or *Acid* Salt, which combines with the Oyl or Sulphur, is now the ſubject of our Inquiry. The enſuing Conſiderations ſeem to determine in favour of the *Acids.*

Firſt, Tartar, which is ſenſibly Acid, and from which a Volatil Salt cannot be ſeparated by any commonly known method, by bare Calcination becomes a ſtrong and perfect *Alcali. Secondly*, Niter, an undoubted Acid with a ſmall proportion of Mineral or Vegetable Sulphur, is converted into a genuin fiery Alcali. *Thirdly*, Niter, which is made by the affuſion of an Acid Spirit upon an Alcali, may be almoſt totally diſtill'd into an Acid Spirit, there appearing not the leaſt footſteps of a Volatil Salt, and ſcarce any of the Alcali, out of which it was chiefly produced.

But theſe are very weak and inconſiderable, compared with Arguments, which *neceſſitate* me to believe, that it emerges from the Union of the *Volatil* Salt with the Oleaginous or Sulphureous Principle. For,

1. There ſeems to be a great Contrariety between *Acids* and *Alcalies*: Being mixt, they heat, fight and mortifie each other; whatſoever one diſſolves, the other precipitates: Whereas, were the Salt of *Alcalies* of a nature approaching

to Acids, they would more plainly unite without that violent contention, which uſually enſues.

2. Alcalies and Volatil Salts agree in moſt properties, excepting their different Degrees of Gravitation. They are both Diuretical and De-obſtruent; they both diſſolve Sulphureous Bodies; agree in their contrariety to Acids, but mix together quietly without noiſe, heat, ebullition, or impairing each other vertues, and are eaſily ſeparable; the ſame in quantity and quality they were before mixture.

3. Tartareous or Eſſential Salts of Vegetables cannot become Alcalies, until their Acidity be driven away; during which operation the Volatil Salts and Oyl uniting, become more ponderous than the Acid, which before did gravitate more than either of them in their ſeparate ſtate: So that ſuch a degree of Fire, as will wholly diſſipate the Acid Spirit, cannot elevate the more ponderous Alcali. Not but that, contrary to what is commonly aſſerted, the moſt fixt Alcali may be ſublimed to great height without additaments, by any intenſe degree of heat: For, I have frequently reduced a pound thereof unto three or four ounces, and recover'd a conſiderable proportion, which was caught in well-contriv'd Veſſels, ſome yards above the Crucible; little, if at all, alter'd from what it was immediately before it ſuffer'd this violence. Upon this account chiefly it is, that ***Soot*** yields ſome ſmall quantity of an Alcali, eſpecially that neareſt the *Focus*.

4. Alcalies may be divided into Oyl and Volatil Salt by facil and natural methods of procedure. I my ſelf have many ways effected this in part: And a very worthy perſon, in whom I can perfectly confide, aſſur'd me, he hath frequently reſolved the whole Body of Alcalies into the two diſtinct ſubſtances of Volatil Salt and Oyl; receiving of the latter a ſmall proportion: Which is alſo confirm'd

by thoſe Trials I have made on the ſame Subject.

I could ſuggeſt many more Arguments and Experiments; but theſe being ſufficient, and, I think, indiſſoluble, I proceed to confute the Pretenſions of *Acid* Salts to an intereſt in this new production. *Firſt*, What concerns *Tartar*, its Acidity is driven away in great quantity before it can become Alcaliſate; and a Volatil Salt may, to my knowledge, be by divers methods ſeparated from it. *Secondly*, as to *Niter*, though that in Diſtillation yields an Acid Spirit, yet it abounds alſo in Volatil Salt; as I could demonſtrate from the manner of its generation, and from irrefragable Experiments. And beſides, perhaps in the operation of the Sulphur on the Acid Salt, ſuppoſing it ſuch, there is a comminution of its parts, and thereby that made a Volatil Salt which was before Acid, only magnitude diſcriminating between them: And that they are often thus produced by each other, I could fully and at large evince.

Having diſpatch't this, I cannot but take notice, that I am credibly inform'd, that many perſons of no ordinary repute for their skill in Chymiſtry, and other Arts ſubſervient to Experimental Philoſophy, have been pleas'd to cenſure in an unuſual meaſure of ſeverity an Aſſertion, accidentally dropt from my Pen, in a Diſcourſe concerning the *Volatil Salts of Vegetables*, in *Numb.* 101. of the *Ph. Tranſactions*; which although circumſcribed by a *Parentheſis*, and an alien to the main deſign and ſcope of my undertaking, yet was ſo far from being thereby protected, that it hath ſuſtain'd the brunt of many unkind reproaches, and been repreſented as a Poſition without foundation in Reaſon or Experience. I ſhall not endeavour by an elaborate Apology to vindicate my ſelf from that diſgrace, whereunto a Charge of being Inconſiderate, Un-judicious, or (which is ſtill worſe) Un-ſincere, muſt neceſſarily expoſe me; but ſhall nakedly and ſimply rehearſe, without

flouriſhes,

in common water. But this is eaſily reſolv'd by what I before ſuggeſted; as alſo by an eaſie obvious Experiment, which may at any ſeaſon in any Plant be readily proved. Take what Wood or Plant you pleaſe, burn it green; the Salt, being extracted out of the aſhes, will, according to the different degrees of fire whereunto it ſhall ſucceſsſively be expoſed, variouſly influence the Mercurial ſolution, the ſeveral Præcipitats differing no leſs from each other, than when made with the Salts of different Plants.

This is alſo moſt evident in *Tartar*, which, the leſs and more gently it is calcined, the more Salt it yields; and on the contrary, a much ſmaller proportion, if ſuddenly and with the higheſt degrees of heat. That which is prepar'd by the former method, is mild and gentle, its Taſt approaching ſomewhat towards that of Acids; whereas the other, which hath paſs'd through the violence of fire, hath not the leaſt affinity therewith, and can almoſt as little be endured by the Tongue as a live coal of actual fire. And there being very many degrees of heat, whereunto the Tartar may be ſucceſſively expoſed according to the ſaid degrees, the manner of applying it, ſpace of time, and ſubſtances employed in its calcination; the Reſult will be different, and produce different effects: And the very ſame ſort of Tartar will oftentimes become ſenſibly different upon theſe methods of procedure, and produce moſt of the appearances mentioned by *Tachenius*. And ſometimes ſeveral parcels of *Tartar*, which ſeem to our Taſt and Eye calcined to the ſame degree; yet the Operations in nice Experiments are frequently various. And to me it doth not ſeem ſo very wonderful, that many Concrets do really differ, which to the Senſes appear ſimple and uniform; of which many cauſes may be aſſigned. A great number, and variety of Inſtances might be here introduced to clear this truth, if it were not already ſufficiently known and believed.

But to proceed where I digreſſed; What I have aſſerted is confirmed by the great variety, which is moſt viſible in *Pot-aſhes*: Some being highly Alcalizate are fiery hot; others, cold, watry, nitrous to the palate, and no leſs weak in Effects then Taſt; whereof Soap-boylers, Dyers, and other Mechanicks are very ſenſible. All which proceeds from the Woods, being, when they are burnt, green or dry; from their abounding with Oily, Aqueous, or Acetous parts; as alſo from the ſeveral degrees of heat imployed in their production. Thoſe who make Glaſs, and eſpecially the finer ſorts thereof, complain, that they cannot with the ſame quantities and proportions of Ingredients alwayes produce the ſame ſort of Glaſs: Which they, not without reaſon, aſcribe to the Differences in their Aſhes. This muſt neceſſarily often happen according to the lately mentioned *Hypotheſis*.

The remainder of this Diſcourſe, affirming the like of *Volatile* Salts and *Vinous* Spirits, with what hath been ſaid of *Alcaliſate* Salts, we refer to the next Month; the room left in this Tract being to be employ'd, as is uſual, in giving an Account of ſome Books.

flouriſhes, digreſſions or circumlocution, the Reaſons, Obſervations and Experiments, which induced me to embrace and publiſh an Opinion, ſo contrary to what hath been hitherto generally received: And I ſhall then appeal unto all un-prejudiced, impartial, and intelligent perſons, Whether the arraign'd Poſition be ungrounded and temerarious; or rather, Whether the Arguments I have produced in its favour and for its confirmation, do not render it highly probable, and excuſe any, who ſhall give it entertainment, from ſuſpicion of Levity or too prompt Credulity.

My Aſſertion was, That *Alcaliſate or Fixed Salts extracted out of the Aſhes of Vegetables do not differ from each other; as neither their Vinous Spirits*; yet with this reſtriction, *if they were highly rectified or purified.* And that I may further manifeſt, I do not diſtruſt my Cauſe, I ſhall add, *Nor Volatil Salts*, not only of *Vegetables*, (which I did heretofore faintly affirm) but even thoſe yielded by *Animals* or *Minerals*, with the before-mention'd limitation of due Purification.

Firſt then, I ſay, That Salts *perfectly Alcaliſed* differ not from each other in *ſenſible*, nor, (ſo far as I have had opportunity to enquire) in *hidden*, properties. It hath been a conſtant and general perſwaſion, that many Fixt Salts do retain, ſome, at leaſt, the Specifical properties of thoſe Vegetables, out of whoſe aſhes they were extracted. The Salt of *Wormwood* and *Mint* are ſaid to be ſtomachical; that of the greater *Celondine* proper for Ictericks; thoſe of *Broom*, *Aſh-Keys*, *Elder*, *Bean-Stalks*, &c. Diuretical; of *Roſemary*, *Sage*, &c. Cephalick; and others, (too many now to enumerate,) which are thought to be endow'd with very different Medicinal properties. I am not very forward to queſtion and quarrel with Opinions and Maxims eſtabliſh't by univerſal conſent, and confirm'd by the Experience of many Ages, unleſs I have ſufficient

reaſon

reaſon to diſtruſt their veracity and validity. In the preſent caſe, the perſuaſion of the Antients, and the Poſition, which I ſhall endeavor to illuſtrate, though at the firſt appearance they ſeem diametrically oppoſite, may be eaſily reconciled. I formerly declared, that moſt Vegetables burnt whilſt green or moiſt, and with a ſmothering fire, yield a kind of a Neutral Salt, which may be call'd *Tartareous*, and ſometimes not improperly *Eſſential*, many of them retaining the Vomitive, Purging, Sweating, Diuretical, Opiate, or other general, and perhaps ſome ſpecifical, properties, wherewith the Plants were enobled which produced them. Now, *whether* 'tis ſome ſmall quantity of the *Eſſential Oyl*, which mixt with the Saline principle renders it ſo variouſly medicinal, the Eſſential Oyles of Plants being manifeſtly as 'twere a *Compendium* of the Plant, which they do equally exactly reſemble in ſmell, taſt, and other qualities: *Or*, whether thoſe vertues are the reſult of the *craſis* and mixture of the ſeveral principles; certain I am, that, after the Oyl is evapoured by an intenſe heat, or the *craſis* diſturbed by avolation of ſome parts, and new combinations of what remains, farewell all Specifical qualities, and conſequently all other differences, than what purety and impurity, and ſeveral degrees of heat may occaſion; ſome being more white and fiery than others. Now, ſome Salts are much more eaſily depriv'd of their Acid and Oily parts than others; and in ſome, on the contrary, the Oyl is of ſo fixt a nature, or rather ſo cloſely combined with the other principles, that it muſt be a very intenſe heat which can disjoyn them, and thereby reduce the Salt to the common ſtandard or aggregate of qualities, wherein all Alcalies agree.

The induſtrious *Tachenius* does ſomewhere pretend to demonſtrate, that there is a *real* difference between the *Alcalies* of different Plants; which he would prove by the various Effects they have upon a Sublimate diſolved

In

An Accompt of ſome Books.

I. Eraſmi Bartholini *de NATURÆ MIRABILIBUS Queſtiones Academicæ.* Hafniæ, 1674. in 4o.

The Subjects of theſe Diſquiſitions are *Ten*, videl.

1. The Figures of Bodies in general.
2. The Figure of Snow.
3. The Pores of Bodies.
4. Attraction.
5. The Carteſian Phyſiology.
6. Experiments.
7. Phyſiological Hypotheſes.
8. Cuſtome.
9. Nature.
10. The Study of the *Daniſh* Tongue.
11. Judgment and Memory.
12. The Secrecy of Sciences.

In the *firſt* the Author having premiſed the *Diviſion* of Matter, and that great Bodies do conſiſt of ſmall ones connected or accumulated, he particularly conſiders in the *Figures* of Bodies, the *firſt* Figure of *Salts, viz.* Whether it be that, which is obvious in the ſeveral ſorts of them; as the *Cubical* in common Salt, the *Sexangular* in Niter, the *Octangular* in *Allum*, &c; and whether it be a well-grounded aſſertion, that that Figure, which we diſcover in Bodies, does depend from the primordial figure of them, and the continuation of the ſame? Where he alſo taketh notice of that great Inequality of Shapes that may be obſerved in a very great Equality, ſuch as is ſeen, *for Example*, in the Faces of Men: Inquiring into the reaſon hereof.

The *Second*, conſiders the *Figure of Snow*, moſtly found *Hexagonal*, though ſometimes *Pentagonal*, and by ſome *Octagonal*. Compare herewith the Obſervations of Mr. *Hook* in his *Micrography*, p. 88. 91; and thoſe of Dr. *Grew* in *Numb.* 92. of theſe Tracts.

The *Third*, about *Pores*, he eſteems, not without cauſe, to be of that importance, that without a good Explication of them both Phyſick and Phyſiology is very lame. Of which Argument we hope the Curious will ſhortly ſee a more particular Account from the Honorable *Robert Boyle*, who juſtly affirms, that from Pores, Figures, Effluviums, and the Languid Motions of Bodies, depend the Reaſons of all thoſe Qualities which the lazy Philoſophy is wont to call *Occult*.

The *Fourth* is of *Attraction*, concerning which he maintains, that all thoſe Effects, which the Vulgar adſcribes to it, belong to *Pulſion*; anſwering ſuch Obſervations, as ſeem to plead for *Attraction*.

Touching the *Fifth*, having declared the *Peripatetick* Philoſophy to be precarious, unintelligible and uſeleſs, by reaſon of its Three inſignificant Principles, he judgeth the *Carteſian* to be ſuch, as proceeds upon *Hypotheſes*, that aſſume nothing but what is conſonant to the Nature of things, and comprobated by Experiments.

In the *Sixth*, he much commends the Uſefulneſs of *Experiments*, judiciouſly and carefully made; and withal warns Experimenters not to be too haſty in concluding from a ſmall and incompetent number of Tryals.

The *Seaventh* ſhews the Unfitneſs, Obſcurity and Defectiveneſs of almoſt all Phyſiological *Hypotheſes* hitherto received, and recommends ſuch, as are clearly and diſtinctly underſtood; and agree with the Principles of Human knowledg, and with Obſervations and Experiments. Compare with this Diſcourſe that of the Noble Mr. *Boyle* concerning the Excellency and Grounds of the Mechanical Philoſophy, lately made publick.

The *Eighth* repreſents the tyranny of *Cuſtom*, eſpecially if it obtains from our Infancy; which is of that power that it maketh men too often conclude, that what is not Cuſtom, is not Reaſon: Alledging withal the variety and ſtrangeneſs of the Cuſtoms of ſeveral Nations and Countrys; and laſtly ſhewing, that as Cuſtom doth paſs into Nature, ſo Nature may be changed again by Cuſtom

The *Ninth* declares, How much *Nature* may be improv'd and advanced by Art, Culture, Care and good Education; and how much impaired and degraded by the want thereof; As alſo, what an excellent Prerogative it is, to have Originally a good Nature, it being far more eaſy to breed and guard vertues in ſuch that are endow'd with it, than where either Nature or Cuſtom of Evil muſt be firſt expelled.

In the *Tenth*, the Author exhorts to the ſtudy and cultivating of his Mother-tongue, which is the *Daniſh*, ſo as to couch and publiſh therein whatever is curious and uſeful, whereby to poliſh, inſtruct and benefit all ſorts and conditions of Men in the whole nation, and ſo to take them off from idleneſs, and free them from poverty, by giving them the occaſion and advantage of reading, and entertaining themſelves in, their own tongue with what is both diverting and advantageous in all kind of knowledg, recreations, practiſes, trades and occupations.

In the *Eleventh* he diſcourſes of the advantages of the Memory and Judgment, far preferring the latter before thoſe of the former, and therefore encouraging all men to employ the beſt of their power in forming and correcting the Judgment.

In the *Twelfth* and laſt he conſiders, with what diſcretion Arts and Sciences are to be diſcover'd and communicated; inclining rather by divulging them to benefit mankind in general, than by making incloſures to be wanting in the exerciſe of humanity.

II. *Thomæ Bartholini* de *ANATOME PRACTICA ex Cadaveribus morboſis adornandâ Conſilium.* Hafniæ, 1674. *in* 4°.

THE Author of this uſeful Diſcourſe conſidering, that the diſſecting and careful obſerving of Men and Women dying of conſiderable *Diſeaſes*, is one of the main *deſiderata* in Anatomy; and repreſenting here, with no ſmall regret, the ſad loſs he ſuſtain'd by fire, of twenty years labours of his own, beſtow'd upon this Subject; he hath been pleaſed, upon the occaſion miniſtred unto him by the like Work, begun by *Theophilus Bonetus* a Learned Phyſician of *Geneva*, to deliver in this Tract his Adviſe concerning that Argument, and the Method he obſerv'd in his writing upon it, as far as he was able to recollect his thoughts about the ſame.

Taking it then for granted, that 'tis the leaſt part of a Phyſitians and Chirurgions skill, to know the conſtitution of the Parts according to the uſual courſe of nature in ſound Bodies, and that the main conſiſts in the inſpection and conſideration of particular ſubjects dead of notable diſeaſes, and in compoſing thereupon an Anatome uſeful in Practiſe: He declares, that he uſed in his Work that periſh'd in the fire, the ſame Method in the Anatome of Men and Women deceas'd by conſiderable Sickneſſes, that he did in his *Anatome Reformata* made up of his Obſervations taken from *ſound* Corpſes. As, *for example*, What is the Scituation, Shape, Colour, Connexion, Subſtance, &c. of the Brain, Lungs, Liver, Inteſtins, and the like, in ſuch as died of the Apoplexy, Epilepſy, Conſumption, Fevers, Dropſie, Jaundiſe, Small Pox, Cough &c; ſolicitouſly examining the *Preternatural* conſtitution of every part in thoſe and other diſeaſes, in order to the better underſtanding of the places affected and the conjunct cauſes.

This being a Work as laborious as neceſſary and uſeful for practitioners in Phyſick, he further particulariſeth the helps, which he made uſe of, and whereby he compaſſed his deſign; worthy indeed to be weighed and embraced accordingly by all the Sons of this Art.

III. *La Lettre de* Charles Drelincourt *à M. Porrée, ſur la Methode, pretendüe Nouvelle, de tailler la pierre: Avec trois autres à* Monſieur Vallot, *Premier Medicin de ſa Majeſté. A* Leide, 1674. *in* 12°.

THESE Letters were written by the Learned Author, upon the Occaſion of a New Lithotomiſt in *France*, pretending to cut all ſorts and ſexes of Mankind of the Stone in the Bladder, how big ſoever, without any conſiderable Medical preparatives; which, as to *Men*, he would perform by introducing into the *anus* ſome fingers of his right hand, well oyled, and thereby finding the Stone immediately, and thruſting it into the neck of the bladder, where it is to be held faſt by an Aſſiſtant; and thereupon having withdrawn his right-hand-fingers, he would place his Patient in a due poſture, and then oyl ſome fingers of his left hand, and ſlide them into the ſame place, turning the neck of the bladder, together with the ſtone, towards the ſmall left *Trochanter*, till with his right hand he could draw the skin of the *perineum* towards the right *femur*, where 'tis to be held with his left thumb, and then with a fit ſingle Inſtrument he would make a Semi-lunar inciſion, and ſo without any other myſtery, as he ſpeaks, draw out the ſtone, and then apply healing Medicines.

As to *Women*, he would perform the operation *adigendo digitos in ſinum pudoris*, &c.

Of this Operation Monſieur *Drelincourt* obſerveth; *Firſt*, That 'tis an Invention as old as *Celſus* himſelf, who lived about 1600 years ſince. *Secondly*, that it cannot be uſed upon adult perſons, eſpecially when they are very corpulent and fat, and the ſtone big and cloſely adhering; ſince it appears not, how in ſuch ſubjects the Operator, that will uſe this method, can reach the bottom of the Bladder. *Thirdly*, that 'tis very doubtful, whether the Bladder can be thus thruſt and turned at pleaſure, as he pretends; and that it cannot but exceedingly torture the Patient, to make ſuch compreſſions, as muſt needs be made both to thruſt down the Stone, and to force the whole Bladder to deſcend to the *perineúm*. And *fourthly*, it ſeems to our Author very ſuſpicious, that this Operator puts his fingers into the fundament, before he places his Patient in a due poſture to cut him. For, ſaith Monſieur *Drelincourt*, if the Operation requires it, why doth he not do this to all his Patients, (at leaſt for a ſhew) but only to thoſe, which he hath cut, as 'twere, playing, of which He affirms and proves that they have been cheated by him. *Fifthly*, notice is here taken, that this Operator diſpatches ſome in two or three minutes, but others he holds above thirty Minutes; and our Author can give himſelf no other reaſon for it, but that he deceives *thoſe*, and cuts *theſe*. *Sixthly*, he notes, that this pretended Artiſt maketh in ſome but very ſlight and ſuperficial compreſſions, and that very few of his Patients make water at the wound, even not at the moment of the Operation. What other cauſe can there be, than that thoſe who urine are really cut, and thoſe that do not urine, receive but a meer inciſion? *Seventhly*, he obſerves, that thoſe that are cured of their Inciſion in five or ſix dayes, whom he proves to have been deceived, are free from all the ordinary ſymptoms of this cutting, but remain ſubject to the ſame *dyſuria*, and make as thick and fetid an urine as before: Whereas in others, whom he cuts indeed, the cicatrice is long a forming, and is preceded ceeded by divers accidents; but then, indolence, and the exemption from fits of the Stone, and the clearneſs of the Urine, do preſently follow after the Operation.

To all which our Author adds, That his proofs are more than convincing, when at the end of three days, upon ſounding, a Stone is found in ſome, and none in others.

And here he takes occaſion to ſhew the marks, whereby to diſcern the Stones of Human bodies from Suppoſititious ones: which are, 1. That the True ones have an uniform colour without; whereas he affirms to have ſeen one of this *Gaſcon*, that was on one ſide white and full of little ſhining bodies, the reſt dark and tawny. 2. The internal colour of the True ones is often various, but that of the bottom approaches to the outward colour. 3. The exterior ſurface is either ſmooth, or full of aſperities. 4. The weight of the True ones is not alwayes proportionate to their bulk. 5. If they be freſh, they ſmell of the Spirit of Urine, and if in time that ſmell abates, or is loſt, it may be recover'd, by caſting ſome pieces or powder of it upon a brick heated red. 6. Upon the True ones, eſpecially if they be rough, there will be found ſticking thin membrans, or ſmall fibres, together with ſome phlegme and blood. 7. Their ſolidity doth often equal that of Flints, yet without ſtriking fire, by what he could ever find. 8. They conſiſt of ſeveral coates, or layers, and in the center a kernel, ſerving for a ground to all the incruſtations; for, theſe Stones having taken their beginning and firſt body in the kidneys, they are thence precipitated into the Bladder, where they are turn'd to and fro, and ſo become incruſtated from time to time by the ſlimy, ſulphureous, ſalin and tartareous ſediment of the Urine. And theſe Stones of the Bladder, *ſaith our Author*, being nothing but Tartar, Earth and Salts, cemented

ted together by a little water and oyl; if you put ſome of the powder of it for a day in a glaſs of water, ſhaking it a little at firſt, a ſalt will be thence obtained, which will alter the freſhneſs of the water, and breed a thin cruſt on its ſurface, as Quick-lime ſleeked in water will do. Beſides, the Stones of the Human body do furniſh by fire far otherwiſe, than by water, *viz.* a *third* part of volatil Salt, and of a very piercing Urinous ſpirit, and about a *fourtieth* part of ſtinking oyl or ſulphur; there remaining about two thirds of Earthy parts, which hold a *thirtieth* part of ſo fixt a Salt, that it will bear a violent fire.

So far the *firſt* Letter. In the ſecond and third our Author relateth, That a certain perſon of *Normandy*, whom the new Pretender affirm'd upon ſounding to have no Stone, was cut of a Stone of three ounces weight; and that he dying ſome days after it, and being open'd, his Bladder was found not only full of very hard Calloſities, like *Ganglions* about the Nerves, but alſo lumps of a white, grumous, ſolid and friable matter, like white Tartar, which was as 'twere cemented upon the ſcirrous ſubſtance of the Bladder: Beſides, there were faſtned to the ſame Bladder certain *Caruncles*, reſembling the heart of a Pullet, large at their *baſis*, and by little and little growing narrower, and ending in a point of a freſh vermillion colour, which end was looſe, whereas their *baſis* ſtuck cloſe to the Bladder, by very many filaments, which as ſo many roots nouriſh'd them, and made them look ſo freſh in this their ſoyl. And what care ſoever he uſed in looſening them from theſe roots without hurting the Bladder, he could not compaſs it; theſe roots being quick and deep: yet he took them off with the point of a Pen-knife, and put them in Spirit of Turpentine, where, he ſaith, he ſtill keeps them.

Laſtly, He obſerv'd ſtore of little ſtrange Bodies, that were ſo interpoſed between the woof of the fibres of the Bladder, that it was thereby exceeding tumified and ſcirrous. He ſaith, he cut it athwart, and found the inner ſubſtance of it very full of veſſels, of which he ſounded many, and found, that though it was hard, yet it was very full of pipes running thorow it, which made him at firſt imagine, that as the Spermatique and Hypogaſtrique channels of a breeding Woman grew big in proportion that the *Embryo* is nouriſh't; ſo theſe Hypogaſtrique Veins and Arteries of the Bladder were all dilated and widened to feed theſe *Caruncles*, which from thence, as their *placenta*, drew all their nouriſhment: But when he ſaw that theſe Tubes did far exceed their ordinary number, he believed, that this was from thence, becauſe that each capillary branch, whoſe ſmallneſs doth commonly hide them from us, was much ſtretch't in this caſe, to furniſh this *Matrix*, (if it may be ſo called) with more blood than ordinary.

Errata in *Numb.* 126.

P. 143. l. 3. pro *illuſtres; addito ſermone*, leg. *illuſtres*; ib. l. 23. *addito ſermone*. p. ead. l. 19. leg. *Latinius*.

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PHILOSOPHICAL TRANSACTIONS.

Novemb. 23. 1674.

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THat which hath been ſaid of *Alcalizate* Salts, may likewiſe be affirm'd concerning *Volatil Salts*, and *Vinous Spirits*: The former are afforded not only by Vegetables and Animals, but alſo by ſome Minerals: And although immediately upon their production or extraction out of the ſeveral ſubſtances which did yield them, they appear ſenſibly different from each other, and are without diſpute endow'd with very different properties, chiefly Medicinal; yet they may all by ſlight artifices be reduced unto ſuch a Simplicity and Identity, as that neither the moſt acute and faithful Senſes, nor the moſt rational and nice Experiments, can find or make, without additaments, the leaſt diſagreement or diſcrimination.

Volatil Salts abound in moſt Vegetables, from which they ſometimes may be extricated by ſimple Diſtillation; but uſually prævious Fermentation is required: of which operation I have formerly rendred

* See Numb. 101. rendred a particular Accompt *. This Salt may alſo be obtain'd from *Soot*, *Urine*, the *Blood* of Men and other Animals; from *Bones*, and eſpecially *Cranium*'s or Skuls of Men; from many ſorts of *Horns*; (and indeed no ſubject yields them ſo copiouſly, as thoſe which are annually caſt by *Staggs* or other Deer;) from Vipers in great plenty; as alſo from divers other Animals. I need not here mention *Factitious Salt Armoniack*, that being a commixture of ſeveral of the mention'd Subſtances with Sea-Salt. Alſo many Minerals and Foſſils contain Volatil Salt; vaſt quantities of Salt Armoniack being found in many parts of the *Eaſt*; which was probably ſublimed into thoſe Caverns, whence it is extracted by the force of Subterraneal Fires: Which conjecture is ſufficiently authoriſed by the ſame Subſtances being gather'd near the *Crateres* or Mouth's of our *European* Vulcans of *Ætna, Hecla, Veſuvius, in Campis Phlægreis*; in *England* alſo near the Mouth's of ſeveral Coal-Mines which have been accidentally fired: And of recent memory that Torrent of melted Minerals, which boiled over the Crucible (if I may ſo ſpeak) upon the late Conflagration in *Sicily*, and poured it ſelf into the adjacent Plains. This liquid Fire, as it cooled, condenſing, became cruſty at top, and almoſt every where Stones of Salts were ſublim'd or thruſt forth by the violence and fury of the Heat. Some of theſe Salts reſembled the vulgar Sea-Salt; others, Niter; ſome were of an Aluminous and Vitriolick nature; but that which was moſt copious and univerſal, was Armoniack; which although much diſcoloured, and rendred very impure in moſt places by its union with various metallick and mineral particles, yet did chiefly, as the Factitious Salt Armoniack, conſiſt of Marine and Volatil, commonly call'd *Urinous* Salts, as did alſo the fore-mention'd; as many Experiments have inform'd me, too numerous and tedious to be here inſerted. Beſides theſe Mineral Subſtances already mention'd, ſeveral ſorts of Earth, Clays and Marle, which are fetch't from the Superficial or Cortical part of the Earth, do contain ſtore of Volatil Salts; which appear upon Diſtillation: And from ſome of them I my ſelf have frequently ſeparated greater quantities than will be eaſily credited. It would waſte more time and paper, than I am willing to loſe, and require more patience in the Reader than the Subject deſerves, ſhould I relate or particularly enumerate the peculiar Senſible and Medicinal properties, whereby the Salts are diſcriminated, which the ſeveral fore-mention'd Subſtances do afford. I ſhall therefore at preſent only ſuggeſt, what in my apprehenſion renders them ſo multifariouſly different from each other; and then diſcover, How they may be

reduced unto the ſame Common nature,and,if you pleaſe,being united, become an Uniform and Homogeneous Subſtance ; wherein I may challenge the moſt ſevere Criticks and experienced Chymiſts, to find a greater variety of Parts and Qualities, than what is abſolutely neceſſary to conſtitute the Eſſence and Definition of a Volatil Salt in the abſtract.

It was long ſince by the famous *Van Helmont* judiciouſly obſerv'd, and by many Experiments confirmed, That variety of *Sulphurs* did chiefly diſcriminate the *Species* of Mixt bodies,and that moſt of the conſiderable changes,which were made in or upon them,were occaſion'd by ſeparating their own,or ſuperinducing an extraneous, Sulphur. If this be affirm'd of Sulphur, a pretended Simple Homogeneous body, and the ſecond Principle of the Chymiſts, it is denied: But if he intended, as is moſt probable, by *Sulphur* a ſubſtance, which,when ſeparated, is uſually inflammable, and doth ordinarily appear in an Oleaginous form, I eſteem his aſſertion very probable and ſpecious.

Let us make a ſhort reflexion on the Oyles extracted out of Vegetables by the aſſiſtance of Common water, which are as 'twere a Compendium of the Vegetables that afforded them,being eminently and manifeſtly enobled with moſt of thoſe ſenſible and thoſe more hidden Qualities that did determinate the Vegetables whilſt flouriſhing: Whereas their Salts,whether fixt or volatile, their Waters and Earths, can boaſt of little, which diſcovers whence they proceeded, unleſs they retain ſome ſmall portion of their reſpective *Oyles,* whoſe preſence occaſions thoſe ſlight differences,which diſcriminate them from each other, and being thereof deprived, they relapſe into their Elementary ſimplicity. The ſame happens, as with Fixed, ſo in Volatile, Salts, which are different ſo long as they retain any mixture of thoſe Oyles and Sulphurs, wherewith the Concrete that afforded them was imbued; from which being freed they all agree in one Common eſſence.

Although I could confirm this Poſition by a great number and variety of Experiments,I ſhall for the preſent acquieſce in ſome eaſie and obvious operations, which will ſufficiently manifeſt, that *all* Volatil Salts, being freed from adhering Oyles or Sulphurs, become forthwith Homogeneal and Uniform.

Take any Volatil Salt, whether Vegetable, Animal, or Mineral, put it into a very tall Glas-body or Bolthead ; ſublime the Salt in Aſhes, B.M,in a Lamp-furnace, or with other equal temperat heat, the more remiſs the better. Repeat this Operation twice or thrice:

Moſt of the Oyl remains at the bottom, or adheres to the ſides of the veſſels employed; and the Salts will not eaſily be diſtinguiſh't from each other, agreeing in moſt, if not all, manifeſt qualities.

But, becauſe this Operation will not ſo well ſucceed, unleſs the Veſſels be very conveniently ſhaped, and the fire exactly regulated by a Judicious experienced Artiſt; for, either skill or due care being wanting, ſome ſmall portion of the more ſubtile fugitive Oleaginous or Sulphureous particles will aſcend with, and infect the Salts, which are thereby ſtill in ſome meaſure (if I may ſo ſpeak) ſpecificated: I ſhall briefly repreſent a more certain and facile method of reducing them into one Common nature and denomination. Pour upon the Volatil Salt, you would purify, a convenient quantity of well-rectified Spirit of common Sea-ſalt. When the Salt is ſatiated, (which is diſcerned by ceaſing of the heat, ebullition or commotion,) then with a gentle equal heat abſtract the phlegme, and with it ſome ſmall quantity of Volatil Salt, which not being cloſely united, is upon the firſt acceſſion of heat preſently diſmiſſed. Sublime the remaining dry ſubſtance, which will become good Armoniac Salt. This being pulveriſed, and mixed with equal parts of a pure and well-calcined Alcaliſate Salt, or if you pour thereon a ſtrong *lixivium* or Solution of any perfect *Alcali*, the Alcaliſate Salt combining more cloſely with the Acid than the Volatile; this latter will be elevated by a ſmall degree of heat, and appears, either immediately, or upon rectification, in the form of a dry ſubtile fugitive Salt, perfectly free from the contagion of Oyles or Sulphurs. And by this Common method of procedure All volatil Salts, although the Tribes and Concrets that afforded them were exceeding different and diſtant, and they alſo diſagreeing in Senſible, and (as they are commonly ſtiled) Occult qualities, are brought unto a perfect agreement in ſome few common properties.

I might add, that, whatſoever can be effected by Artificial operations, in order to the Un-ſpecificating of Volatile Salts, is more naturally and ſpeedily perform'd by the *Air* *, which is, as I could fully demonſtrate, impregnated with a Volatil Salt, *partly* ſublimed by Subterraneous, and extracted by Celeſtial, fires; *partly* expired from Animals during their life; and both from them and Vegetables upon the diſſolution or diſſociation of their conſtituent parts in Arefactions and Fermentations. Theſe Salts, being received into the vaſt ſubtle fluid Expanſe, are immediately deveſted of their diſcriminating properties, and become the Inſtruments of ſundry remarkable effects and operations, not only in Natural, but alſo Artificial, productions: Which Salt may be obtain'd by ſundry methods, and out of ſeveral ſubſtances in its pure ſimplicity; but being once diſſolved in Rain, and Dews, and thereby inſinuated into the Earth, or otherwiſe caught and conveyed into Vegetables, they are ſoon ſpeciated, and by union with the other Principles or Corpuſcles of a different nature, do degenerate, or are exalted (which you pleaſe,) and of Simple (at leaſt comparatively) become Compound ſubſtances; yet eaſily again reducible, by Nature or Art, unto their primitive Simplicity.

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* See Mr. *Boyle's* Tract of *Suſpicions about ſome Latent Qualities in the Air*, lately printed, and come to my hands when I committed this Diſcourſe to the Preſs: Of which Tract I ſhould have given an Accompt in theſe Papers among other Books, but that it is accompanied with ſome other pieces, that are not yet quite printed off.

Theſe are not Dreams of a delirous Chymiſt, but Poſitions, which I could confirm by an entire *Series* of Experiments; poſſibly hereafter to be communicated, if upon a ſtrict *examen* I find them worthy publiſhing in this Inquiſitive and Judicious Age.

It remains, that I ſhould detect the ſame Identity or Uniformity of nature and properties to reſide in all, highly rectified, *Vinous* Spirits, which we have diſcover'd in Salts both fixt and volatil.

That *Vinous* ſpirits are only (or at leaſt chiefly) the more ſubtle fine Oyles of Vegetables, by fermentation broken into leſſer particles, and leſs branched than thoſe which conſtitute the Oyles themſelves, will appear highly probable to him, that ſhall duly conſider the Manner of their production, and ſeems demonſtrable by divers obvious Experiments. For, the ſame quantity of Vegetables, which being diſtilled with water, no fermentation preceding, yields Oyl plentifully, and little, if any, Vinous ſpirit; being diſtilled after a convenient time of Digeſtion, and the addition of ſome proper Ferment, they afford ſtore of Vinous ſpirits, and if fully fermented, there is little appearance of Oyl. Alſo the ſame Herb, fermented after its Oyl is extricated by the uſual method, yields a farr leſs proportion of Vinous ſpirits, than when fermented, before it was deprived of its Oyl. That portion of the Oyl, which is by the fermentation divided into leſſer particles, although, notwithſtanding this comminution, they are (according to the *Carteſian* Hypotheſis) branched enough to continue inflammable, yet being minute; do not affect the Palat after ſuch different manners, or make upon it ſuch a variety of impreſſions, as thoſe that are occaſioned by impulſes from the more groſs Oleaginous particles.

Now, if the ſmaller and more ſubtile matter, which we ſhall henceforth call *Vinous Spirits*, being preſs'd by heat, carry up and convey along with them ſome entire unbroken Oily parts,or receive them that are capable of being elevated with the ſame degree of heat by which they were raiſed; theſe mixtures will retain ſomewhat of the moſt remarkable differences in Taſt, and ſometimes Odour, whereby the Vegetables themſelves on their Oyls were diſcriminated: But upon long frequent Digeſtions, or reiterated Diſtillations, theſe groſs Oleaginous particles are either ſubdivided, and thereby become Vinous ſpirits, or that gentle equal degree of heat, which is ſufficient to elevate the more active volatil Vinous ſpirits, cannot raiſe the more ſluggiſh Oyles; ſo that the Reſults are pure ſingle homogeneous Vinous ſpirits, which, whatſoever the Concretes were from whence they were derived, though vaſtly differing from each other, as alſo their Oyls, out of which the Vinous ſpirits were more immediately produced; yet the Spirits themſelves thus purified are in Outward appearance ſimilar, and perhaps as perfectly ſimple and homogeneous, as moſt ſubſtances in the Univerſe.

What I have deliver'd, is further confirmed by a more viſible palpable Converſion of Vegetable Oyles into Vinous Spirits;which I have effected in *many*, and, by Analogous operations, I preſume, the ſame change may be ſuperinduced upon *all*. Pour upon an ounce of ſome common vegetable Eſſential Oyl two or three pound of Vinous ſpirit perfectly dephlegmed; (the greater quantity,the more ſpeedily is the tranſmutation or change performed:)The Spirit will immediately, upon ſimple agitation, abſorbe, devour, or diſſolve the Oyl,which by long digeſtion or reiterated cohobations may be totally deveſted of all thoſe peculiar properties, it enjoyed whilſt an Oyl, and become perfectly Vinous, never to be ſeparated in a diſtinct form, or by any known *diacritical* ſign or artifice,to be diſcriminated from what hath, in all appearance, converted or tranſmuted it into its own nature, or,at leaſt,into a ſubſtance ſo like it ſelf as to deſerve the ſame denomination.

I ſhall here inſtead of a Concluſion impart unto you two very odd ſurpriſing Experiments, which have ſome, though remote, relation unto the preceding Diſcoveries concerning Alcalizate and Volatile Salts.

Having procured a great quantity of *Fern*-aſhes,I extracted their Salt after the common method with water; moſt of the water being evaporated, I obtain'd ſeveral pounds of Salt, the greateſt part whereof being firſt dried, I expoſed the remainder unto the Air, that it might arreſt ſome of the Vapors flitting in the ſame, and thereby became fluid; which is commonly, tho improperly, ſtiled an Oyl *per deliquium*. The reſt of the *lixivium* which continued fluid, being filtred whilſt warm, was of a very red colour, deeper than that of *florid* Blood, or of moſt Clarets, and exceeding ponderous: The *colour* argued it abounding with Sulphureous or Oily parts, and the *weight*, that it was highly ſatiated with the Saline. Having put this ſtrong Solution into a capacious glaſs, I either forgot or neglected it five or ſix weeks; and then looking after it, my Eyes were unexpectedly ſaluted with a moſt pleaſant ſpectacle, which having arreſted, did immediately fix, detain and employ them in the contemplation of an Object, which did at once moſt charmingly invite and fully requite their greateſt attention. The *Lixivium* had depoſited a large portion of the Salt it formerly contained, part of which ſubſided, I ſuppoſe, immediately upon its cooling; and, ſeveral weeks of very cold weather enſuing, did occaſion the Præcipitation of more: So that, according to my eſtimation, it was at leaſt 2 inches thick over the bottom of the Veſſel. The loweſt part of the Salt was of a dark colour, as if ſome earth, dirt, or dregs, were admixt therewith. The upper part or ſurface contiguous to the Liquor was exceeding white; and there did ariſe or ſpring out of the whole maſs of Salt, at ſmall diſtance from each other, ſeveral, I believe 40, branches, which, abating the colour, did moſt exactly reſemble that ſort of *Ferne* which is ſingle like *Polypody*, and not branched, ſending out ſeveral leaves on each ſide from one ſtem. Their magnitudes were divers, but the figures of all were the ſame, without the leaſt variation; only ſome emitted more leaves from the ſtem than others; which is alſo uſual in the Natural Fern. I preſerv'd theſe Artificial, regenerated or reſuſcitated Vegetables many weeks in the ſame poſition, not moving them, they being of ſo tender a fabrick, that the leaſt motion of the Glaſs did hazard their diſappearance. Several perſons were entertain'd with this admirable Phænomenon; and enquiry being made, before they were prepoſſeſſed with the foregoing Relation, what Herb they did apprehend this pretty Phantaſm repreſented, did unanimouſly refer it unto Fern. But this agreeable Scene ſoon vaniſhed; for, upon my return out of the Country, where I then reſided, unto *London*, although I had uſed all imaginable care and diligence to preſerve them in their priſtine beauty and integrity, by agitation during the Journey, or ſome other accident, theſe pretty appearances were reſolv'd into the confuſed Chaos out of which they were educed.

Obſ. 1. The Fern was of a middle conſtitution between green and dry when burnt.

2. It was imployed to dry Malt burnt in a Kiln with a cloſe ſmothering heat.

3. Therefore the Aſhes yielded a far greater proportion of Salt, than when the Herb is very dry, and incinerated by a free open fire.

4. From the ſame cauſes the Salt was not perfectly Alcalizate, but plainly Tartareous, and abounded with Oyl and Acid particles; and therefore might properly enough be called an Eſſential Salt: And upon fuſion with a ſtrong fire was much changed, from a dark brown becoming white, and was by the action of the fire much leſſen'd in bulk, the conſequence of the avolation of Oyl, Acidities, and perhaps other Subſtances, during the operation of ſo ſtrong a fire.

5. That part of the impure Salt, which, as I before intimated, was ſet to deliquate, did not, as is uſual, become liquid, but a perfect gelly, which could not by any method be afterwards reduced unto its ſaline form: Which recals unto my mind what is deliver'd by *Kircher* of his own perſonal experience in the Reſuſcitation of Plants, who affirms, that at ſome certain time of the operation the prepared Vegetable Subſtances appear in ſuch a form.

The other Experiment concerning *Volatil* Salts ſucceeded after this manner;

Having occaſion for Volatil Urinous Spirits for ſome ordinary uſes, I mixt equal parts of Sal Armoniac and Pot-aſhes, which latter had a very ſtrong ſulphureous ſmell, yet did ſeem to abound with Salt, and that conſiderably Alcalized. The mixture being put into a tall Glaſs-body, immediately upon its feeling the heat, plenty of a Volatil Salt ſublimed, from which I expected no unuſual appearance, having often repeated this operation without obſerving any circumſtance which deſerv'd peculiar attention. Being called from my Laboratory by ſome Company or Employment juſt as the Salt began to appear, at my return I was amazed to ſee in the Glaſs-head, which was, as the Cucurbit, very ſpacious or capacious, a Foreſt in perſpective, ſo admirably delineated, as not to be excelled, if imitated, by the pencil of the greateſt Maſters in painting. They were all, not only to my apprehenſion, but alſo in the Opinion of ſeveral Spectators, ready to atteſt it, Shadows, Rudiments, Adumbrations, or Repreſentations of *Firrs*, *Pines*, and another ſort of Tree which I cannot eaſily deſcribe, nor have I ever ſeen it growing wild or in gardens, or in any Herbal exactly repreſented. All theſe Images, although very numerous, very reducible to one of theſe *three* ſpecies. I do not remember, that I have ever ſeen any more tranſportingly agreeable Appearance in any Chymical operation, although it is well known, that Chymiſtry doth daily preſent thoſe, who are very converſant with her, a great number and variety of objects, highly diverting for their prettineſs and curioſity in colour, figure, and other accidents.

But to return unto the foremention'd Operation, I am not ignorant, that Volatil Salts do conſtantly ſhoot into variouſly and beautifully ſhaped Cryſtals, but I could never obſerve them regular, or reducible unto a certain number of figures; whereas in the Operation we have deſcribed, the figures were *firſt* very different from any that ever appear'd before or ſince upon Diſtillation of Commixture, and Diſtillation of Pot-aſhes and Salt Armoniac, altho by me frequently repeated; as neither upon the Diſtillation or Rectification of Hartshorn, Blood, Urine, *Cranium humanum*, Salt Armoniac with Lime, Salt of Tartar, and other Alcalies. *Secondly*, The Figures were all reducible, in the apprehenſion of every Spectator, unto *three* kinds, two of them commonly known; and ſome of them were perſons not eaſily bribed by fancy.

Howſoever, had I been conſiderate and well adviſed, I might have eaſily ſilenced doubt and detraction both, by preſerving the Glaſs containing this beautiful Scene, which was prevented by my aſtoniſhment at, and too greedy contemplation of, ſo delicious a ſpectacle; whereof, to my great grief, I was ſoon deprived by the Sublimation of more Salt, which filling up the Interſtices, did, together with the former, caſe the Glaſs, and retained no other Figure than the Concavity thereof allow'd of.

The next day that great Virtuoſo, Sr. *Robert Moray*, (whoſe memory can never be too much cheriſhed, nor his loſs ſufficiently bewailed,) honouring me with a viſit, I acquainted him with the lately recited Accident; who ſcrupled not, though a rigid Philoſopher, to credit my Relation, and to confirm me in the belief, that ſome certain governing principle might contribute towards the production of this *Phænomenon*. He affirm'd, that one *Daviſon*, a famous and experienced Chymiſt at *Paris*, had frequently ſhew'd him in a Glaſs a great company of *Firrs* and *Pines*, which ſeem'd no leſs lively and accurate, than thoſe produced by Painters are; but ſuch ſuſpicions were ſoon ſtifled by their ſpeedy diſappearance and eaſie reproduction. He alſo referr'd me unto his Book of *Chymical Operations*, where I find he makes mention of it,

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as a great artifice, as really it was, and makes it no leſs a myſtery by concealing the proceſs or manuals, whereby it may be effected; only, that nothing was emploied beſides ſubſtances afforded by the Trees which were repreſented; and that the chief Ingredient was Turpentine. Herein his operation differ'd from that which I lately recited; in that the ſubſtance, out of which he raiſed thoſe ſhapes, was of a more Fixed Nature; that which afforded mine, Volatil to the higheſt degree: *He* could conſtantly and regularly produce theſe Figures; but *mine* did unexpectedly and fortuitouſly repreſent themſelves unto my view; neither do I ever again expect the like appearance. Nor will I contend with *him*, that ſhall affirm, it was a mean Phantaſme, or a fortuitous Coalition of Salts into ſuch pretty figures. But that they were not really ſuch as I have related, the moſt Satyrical *Railleurs* or moſt obſtinate *Scepticks* ſhall never prevail upon me to recant and deny.

More Obſervations from Mr. Leewenhook, *in a Letter of* Sept. 7. 1674. *ſent to the Publiſher.*

I Took, (*ſaith he*) the *Eye* of a Cow, and having with a great pin pierced the *Cornea*, I found in the *Aqueous humor*, which I took out, ſome *few* cryſtallin globuls ſwimming. The dark-brown colour, which I ſaw in this Eye, did conſiſt of dark gray globuls.

The *Cryſtallin Humor*, which in hardneſs almoſt reſembles a Nutmeg preſerv'd, I have with a raſor cut aſunder, and obſerving it in parcels, I found it to be made up of orbicular Scaly parts, lying upon one another, which had their beginning out of the Center, and did all conſiſt of cryſtallin globuls.

After I had let this Cryſtallin humor dry for three dayes, it was grown ſo hard, that, when I put the knife to it, it burſt in pieces as if it had been hard roſin. Theſe pieces being by me view'd again, I not only found in them the aboveſaid orbicular Scaly ſubſtance, but alſo, that every ſcale was compoſed again of circular parts, and that theſe circles run contrary to the firſt; like to a Globe made up of paper, to the uppermoſt paper of which may reſemble the outermoſt ſcale or plate of this Cryſtallin ſubſtance; under which uppermoſt Superfice there lyes another ſcale, and ſo on continually unto the center of the globe: This I take to be like the firſt orbicular ſcaly ſubſtance, of which the Cryſtallin humor is made up. The other round ſubſtance, of which each ſcale is compoſed, I ſee, as if upon the mention'd Globe there were drawn lines cloſe by one another, the firſt thereof paſſing through both poles, and the others running along the ſides thereof, juſt as if the ſuperfice of the globe were compounded of ſuch ſmall parts as lines could be drawn upon a globe. And I found all theſe particles to conſiſt of cryſtallin globuls. Two or three ſmall pieces of this Cryſtallin body I have fixed to ſeveral pins of my Microſcopes, which I have laid by, to ſhew them to the Curious upon occaſion; not being ſatisfied to ſee ſuch things my ſelf alone, but very willing to preſent others with the ſame view; although I have already found more than once, that ſome have made their particular advantage by it.

Dr. *Swammerdam* hath again within this fort-night viſited me twice, accompanied with a Gentleman, to both which I have ſhew'd many of theſe Microſcopical Obſervations, and of ſuch others as I had formerly ſpoken to him about; perceiving, that his ſpeculations are buſy upon this ſubject, and that probably he will diſcourſe more largely of it than I have done hitherto.

To proceed; having view'd the *Vitreous* humor, lying deeper in the Eye, I ſaw *many more* globuls than in the *Aqueous* which I took out from the top of the Eye.

The tranſparent *Cornea*, after I had let it dry for ſeveral days, I view'd alſo, and found it likewiſe to conſiſt of cryſtallin globuls; and endeavouring to ſever the ſaid tunicle in its thickneſs, I found the globuls thereof united ſo cloſe and compact, that the ſame ſeem'd to conſiſt of manifold ſinewy particles, croſſing one another: And how curiouſly ſoever I have hitherto endeavour'd to view ſome of the Scaly parts, yet I have not yet ſatisfied my ſelf therein; I obſerv'd only ſome ſtreaks reſembling the ſcars of a newly whetted raſor. Mean time it ſeem'd, that this membrane would ſuffer ſeparation when 'tis moiſt.

I formerly wrote to you, that till then I had obſerv'd, that all tranſparent and ſuch particles, as lye upon one another, appear'd to our Eye white: The ſame I obſerve in the above-mention'd *Cryſtallin* liquor when dryed hard and then beaten to pieces: But when 'tis moiſt, 'tis then not white.

In the *ſecond* Tunicle of the Eye, there appear'd divers very fine glittering colours, and it was black, and conſiſted alſo of globuls, and viewing the ſingle globuls, I found them dark; and paſſing my finger over this colour'd membrane, and the ſame being grown dry, the colours were gone, and the membrane was darker.

The *third* Tunicle, was exceeding thin and tender, and having viewed it, I found it alſo to conſiſt of globuls united.

I communicated theſe Obſervations to *Doctor Schraveſande*, and ſhew'd him the Cryſtallin humor; and he mentioning, that ſome Anatomiſts

natomiſts affirm'd the *Optic* Nerve to be hol'ow, and that themſelves had ſeen that hollowneſs, through which they would have the Animal ſpirits, that convey the viſible ſpecies, repreſented in the eye, paſs into the Brain; I thereupon concluded with my ſelf, that, if there were ſuch a cavity viſible in that Nerve, that it might alſo be ſeen by me, eſpecially ſince, if it be ſo, it muſt be pretty bigg, and the body of it pretty ſtiff, or elſe the circumjacent parts would preſs it together. And in order to this diſcovery, I ſollicitouſly view'd three Optic Nerves of Cows; but I could find no hollowneſs in them; I only took notice, that they were made up of many filamentous particles, of a very ſoft ſubſtance, as if they only conſiſted of the corpuſcles of the Brain joined together, the threds were ſo very ſoft and looſe: They were compoſed of conjoined globuls, and wound about again with particles conſiſting of other tranſparent globuls.

Theſe Obſervations I likewiſe imparted to the lately named *Doctor*, who thereupon encouraged me to proceed to others; which made me to attempt a view of the *ſixt pair* of Nerves, call'd *par vagum*, cutting it off about the pipe in the Lungs of a Cow, and finding it to conſiſt of a very few filamentous particles, compoſed of globuls joined together, which threddy parts are very ſtrong, (to which thoſe of the Optic Nerve, as to ſtrength, are not at all to be compared,) and they lay as wound about with a matter made up of pellucid globuls, of which the ſmall threds were compoſed. Further, that Nerve within was for the greateſt part filled with globuls far bigger than thoſe, of which the Nervous parts were made up; which filling globuls I can judge to be nothing elſe but *Fatt*. And betwixt this Fatt and the Nervous filaments I at firſt ſaw now and then ſome hollowneſs, which I eſteem'd might have been cauſed by the knife. This I did with much ſollicitude further inquire into; whereupon I found not only one hollowneſs, but as often as I cut the Nerve aſunder, the hollowneſs ſtill continued therein, and I found in ſome places not only one cavity, but two or three cavities at once; and where the cavity of the nerve was any thing bigg, it was lined about with filmes, as if they had been purpoſely contrived there to keep open thoſe cavitys, and to keep them from being compreſſed by the ſurrounding parts.

This cavity in the Nerve was alſo furniſht with a Tunicle, as if it had been a great Artery (in proportion to the Nerve.) In the ſame Nerve I alſo ſaw ſeveral little Arteries running through. But as to its ſtrength, that was but very ſlender, not fit for any ſtrong motion, foraſmuch as I obſerv'd, that, beſides the Tunicle, it was in ſome places provided only with two or three threds; and it was moreover filled with *fatt*, and had the before-mention'd hollowneſs.

To paſs on to other objects; I have obſerved ſomewhat about *Salt*, of which I took a little and put it on the brim of a Tin diſh, and ſo let it melt in my celler, and having expoſed that Brim to the hot Air, or the Fire, I had it turn'd into Salt again; and then found, that ſome of thoſe Saline parts conſiſted of globuls, others of Conical ſmooth particles, others were pyramidal and ſmooth, ſome perfectly quadrangular, and ſmooth, ſome long-ways quadrangular; in both of which latter I ſaw again ſome very ſmall ſquares.

More-over, I have alſo viewed ſome of the *Engliſh* Earth which is yellowiſh, and ſome that is of a deeper yellow then that, which is found between *Harwich* and *London*, and wherewith ſome Land is only as 'twere cover'd; Which yellowiſh Earth our Potters of Porcelan-ware make uſe of, when they want that Flamiſh Earth that is got about *Tournay*. This Engliſh Earth I found to be made up of very fine globuls, which by my eſtimate I judged to be many thouſand times ſmaller than a common grain of Sand, after a Geometrical computation, by which the *axis* of a grain of Sand is many hundred times bigger than the *axis* of one of the particles which compoſe the ſaid Engliſh Earth.

I have likewiſe examin'd the lately mention'd *Flamiſh* Earth, which I found to conſiſt of globuls, yet ſomewhat ſmaller than thoſe of the *Engliſh* Earth.

Again, viewing that ſort of Earth, which we call *Clay* of which there is great ſtore about this Town of *Delft*, and elſewhere in this Country, that is made up of yet ſmaller globuls than both the foregoing ſorts, and 'tis by our Porcelan-makers call'd Black Earth, being of a dark gray colour. The globuls of this Earth are not ſo heavy as thoſe of the deſcribed Engliſh and Flamiſh Earth; and 'tis eaſily changed into Glaſs; and they make very ſtrong Pots of the ſame: But being baked, 'tis red, and therefore not fit for Porcelan, but 'tis blended with the Engliſh and Flamiſh Earth, to give a ſtrong and good ſound to our Porcelan. Mean while I did not find this black Earth ſo pure as the other, it being mixt with other particles which I did not think to be Earth, but rather eſteem'd them to be *rotten wood*, mixed with ſand and ſandy particles, that were above a hundred times ſmaller than ſand.

About two Leagues from this Town there lyes an Inland-Sea, called *Berkelſe-Sea*, whoſe bottom in many places is very mooriſh. This water is in Winter very clear, but about beginning or in the midſt of Summer it grows whitiſh, and there are then ſmall green clouds permeating it, which the Country-men, dwelling near it, ſay is cauſed from the Dews then falling, and call it *Hony-dew*. This water is abounding in Fiſh, which is very good and ſavoury. Paſſing lately over this Sea at a time, when it blew a freſh gale of wind, and obſerving the water as above-deſcribed, I took up ſome of it in a Glaſs-veſſel, which having view'd the next day, I found moving in it ſeveral Earthy particles, and ſome green ſtreaks, ſpirally ranged, after the manner of the Copper or Tin-worms, uſed by Diſtillers to cool their diſtilled waters; and the whole compaſs of each of theſe ſtreaks was about the thickneſs of a man-hair on his head: Other particles had but the beginning of the ſaid ſtreak; all conſiſting of ſmall green globuls interſperſed; among all which there crawled abundance of little animals, ſome of which were roundiſh; thoſe that were ſomewhat bigger than others, were of an Oval figure: On theſe latter I ſaw two leggs near the head, and two little fins on the other end of their body: Others were ſomewhat larger than an Oval, and theſe were very ſlow in their motion, and few in number. Theſe *animalcula* had divers colours, ſome being whitiſh, others pellucid; others had green and very ſhining little ſcales; others again were green in the middle, and before and behind white, others grayiſh. And the motion of moſt of them in the water was ſo ſwift, and ſo various, upwards, downwards, and round about, that I confeſs I could not but wonder at it. I judge, that ſome of theſe little creatures were above a thouſand times ſmaller than the ſmalleſt ones, which I have hitherto ſeen in chees, wheaten flower, mould, and the like.

An Accompt of ſome Books

I. *Die AFRICANISCHE Landſchaft FETU beſchrieben durch* Wilhelm Johan Muller *von Harburgh*; *Gedruckt zu Hamburgh*, 1673. *in* 12o.

THis piece, compoſed and printed in *High-dutch*, containing divers not inconſiderable obſervations made by an Author, that lived eight years in *Fetu*; it was thought, the Reader would not be diſpleaſed to find ſuch of the Obſervations as are ſutable with the deſign of theſe Papers, Engliſhed, and transferred hither.

The Province or Country of *FETU*, (the ſubject of this Book,) is ſcituate about the middle of the Gold-coaſt in *Guiny*, in $5\frac{1}{2}$ deg. Northern latitude: In length reaching from *Cabo Corſo* to the borders of the Kingdom *Abraham Bu*; in breadth, from *Annoma Gruſſu*, (a Sea-port between the mountain *Congo* in the Land of *Sabu*, and *Amamfro* or *Friedrichs-burg*, belonging to the King of *Denmark*,) to *Commende*. Through the middle of it runs a River, which diſcharges it ſelf at *St. George della Mina* into the Sea.

The Author having diſcourſed at large of the Towns, Forts, and Villages of *Fetu*, deſcribes the Nature and Quality of that Country and its Inhabitants. The Soyl ſo fertil, that there is a double Harveſt every year, *viz.* in *July* and *December*; but the Air very unhealthy to ſtrangers, eſpecially in the Rainy ſeaſon, of *April*, *May*, and *June*; not ſo to the Natives, who are not afflicted with that peſtilential Feavor, which commonly invades our *Europeans* living there; though they, as well as Forrainers, be troubled with a kind of Worm, that breeds in the fleſh, which, in the opinion of the moſt intelligent, proceeds from the drinking of troubled and fetid waters, which the poorer ſort, that cannot get or pay for their Palm-wine, muſt be contented with. For the cure of which worms they uſe Palm-oyl, wherewith they anoint the place which the inſect will iſſue at, where when it appears, they wind it gently about a ſlender twig, and ſo fetch it out whole, being very careful that it break not.

As for the *Natives*, they are Black; though the Author obſerves, that their Children, when firſt born, are not ſo, but of a white-yellowiſh colour, which yet in a month or ſo changeth into black. They take great care of keeping their teeth very white and clean, chawing to that end little peeled ſavoury ſticks, and therewith rubbing them; which wood is not named here, but is ſaid to grow in *Acania*, a neighbouring Kingdom. Theſe Blacks are here commended for their excellent memories, which they cultivate by the frequent repetitions of ancient actions and paſſages hapn'd in their Country: To which is here added an Obſervation of their ſingular ability in caſting, even large, accounts meerly in their heads, without uſing any writing or counters. Their whole year conſiſts only of *Eight* months; and to avoid miſ-reckoning, they tye eight knots in a ſtring, one every time that a New Moon appears. And by theſe knots they alſo reckon their Age.

Concerning the Diſpoſitions of theſe *Blacks*, they are humane and kind when not provoked, and liberal enough (according to our Author,) and very compaſſionate to one another, having alſo a great ſenſe of gratitude: Mean time they are idolaters, revengeful and choleric when provoked; luxurious, thieviſh, falſe, and

maſters

miſters in palliating or maintaining falſities: wherein our Author notes them to be ſo ſtubborn, that they will rather ſuffer themſelves to be tortur'd to death, than confeſs the truth. On which occaſion, 'tis here related, that a Youth endured a very ſharp whipping with thorny rodds, together with a rubbing of his wounds with Salt and Limon-juice, and a burning of the middle of his fingers and toes with a lighted match, rather than that he would confeſs the thing he was accuſed of.

Touching their *Worſhip*, and Civil Government, the particulars thereof are very largely deſcribed here, but are beſides our purpoſe. It ſeems, (to touch ſo much in ſhort,) that they, upon occaſion, by their Prieſts conſult their Idol, call'd *Oboſſum*, *Summan*, or *Fitiſo*, and receive Anſwers from him; that they ſacrifice to him, keep Holy days in honor of him, and eat and drink certain things in his name. They have a *King* over them, who yet may decree nothing but by the approbation and conſent of the chief perſons of the Nation. He proceeds in the adminiſtration of Juſtice not according to any written Laws, but received Cuſtome, puniſhing Murther and Theft with death, as alſo ſuch Adultery as is committed by a Concubin; a true wife being, in that caſe, repudiated. In their Warrs they uſe Muſquets, Bows and Arrows, Zables, Javelins; and for their Trumpets they employ great Elefants-teeth. They poiſon their darts with a preparation of Crocodils-gall.

As to their Oeconomy, our Author relates their manner of Building, Houſholdſtuff, Waſhings, Cloathing, Painting, Meat and Drink, Marriage, Weddings, Education of Children. 'Tis ſomewhat ſtrange, that they reliſh their Fiſh moſt, when ſuch of them as are unſalted have layn ſeveral dayes expoſed to the Sun, and are become ſtinking. Elefants-fleſh is alſo a great delicacy amongſt them, even after it has been dead many days, and ſtinks like carrion. Their drink is Water, Palm-wine, and Bier, which latter they make of the great Millet and Water; after they have malted their Millet, by infuſing it in water, and ſo letting it ſhoot or ſprout, and then expoſing it to the Sun to dry. They are exceedingly addicted to drink French Brandy, in compariſon of which they deſpiſe all ſtrong waters made of Corn, and all that ſort which comes hither from the *Barbados*, call'd *Kill-devil.*

Diſcourſing of their Marriages and Weddings, he taketh notice of an Herb, (which yet he names not) bearing a yellow flower, which is ſhut in the morning and the whole day, but opens about evening; wherewith their women waſh and rub their bodies before they are bedded the firſt time, from a perſuaſion that it maketh fruitfull.

They have a very barbarous cuſtome amongſt them, to kill thoſe of their children, that are born with the leaſt monſtroſity or defect in any of their limbs; as alſo one of ſuch twins, as are born of different ſexes, *viz.* that which they like worſt; though, when twins are of one and the ſame ſexe, they preſerve them both alive. Their Women brought to bed, are generally able to go abroad the ſecond or third day, and to betake themſelves to their ordinary work and labour again. They never ſwadle their children, but looſely put about them a piece of linnen-cloth, and ſo lay them upon a ſtraw-matt to the mother.

What concerns their *Husbandry*, they have chiefly two ſorts of Corn, which our Author calls the great and ſmall *Millet*, but by his deſcription ſeems to be the ſame with Turky-wheat; of which one grain often produces two or three ears of Corn, which not ſeldom yield five or ſix hundred grains. They uſe no Plow, but a Mattock, for ſowing; making therewith a furrow of three or four fingers deep with one hand, and fetching the ſeed out of a little ſack, tyed about their body, with the other. And inſtead of a Sith they make uſe of a great knife.

The Juyce of their Palm-trees is very agreeable both to the taſt and ſmell, when drunk freſh; and grows ſo ſtrong by ſtanding but one night, that it will ſoon intoxicate. 'Tis uſed, when recent, againſt Obſtructions, it being then conſiderably laxative; and 'tis likewiſe ſo very diuretique, that very few among the Blacks are afflicted with the Stone or Gravel. Beſides, it cauſes no head-ach, though it be drunk plentifully. There is two ſorts of them, of which they count, the one Male, the other Female, *this* bearing a fruit reſembling peeled Plums, and yielding an Oyl by expreſſion; the *other* bearing no fruit at all. The Oyl is both medicinal, eſculent, and ſerving for Lamps. The trunk of this Tree is good fewel; the branches ſerving for the covering of their houſes; the Leaves for thred to ſew their cloaths withal.

Their chief and beſt fruits are, the *Banannas*, *Baccofes*, *Enjamos*, *Patattas*, *Aggwivre*, *Croſſe*, *Turreba*, *Aduba*, *Malaguette*, *Colà*, *Cocos*, *Brambas*, *Anaſſas*.

The *Banannas* grow on a Tree having no wood at all, but only meer leaves, which twiſt together, ſometimes to a ſtem of a German Ell thick, which when 'tis grown up two or three ſuch Ells high, it ſhoots forth other leaves, *&c.* And as oft as new leaves grow out of this Tree, the former dry up, until the Tree do arrive to its full growth, and the fruit to its due perfection; which how it grows, and how pleaſant it is both to the Eye, Taſt, and Smell, is here largely deſcribed.

The *Baccoſes* differ from the former only in this, that this fruit is ſhorter and thicker, and within whiter; the taſt alſo and ſmell more pleaſing. Of it 'tis noted, that being cut thorow into ſlices, it preſents a perfect Crucifix. Whether Imagination do not herein help Superſtitious men, I muſt leave to the Autopſy of ſevere Examiners of truth.

Enjamos is like to the greater ſort of our European Turnips, though not ſo juicy and ſweet as they. Their *Patattas* are ſo good, that if they be boyled with unſalted fleſh, it gives the broath and meat ſo agreeable a taſt, as if Roſe-water had been put to it.

Aggwivre is their Sugar-Cane. *Croſſe* is like our Haſelnuts, but hath no hard ſcale. *Turreba* is a ſort of Earth-apple. *Aduba*, a kind of Bean. *Malaguette* is their pepper, inferior to that of the *Eaſt-Indies*. *Colà* is as bitter a fruit as bitter Almonds, growing upon tall trees, and in coats like Cheſtnuts: The *Blacks* that take no Tobacco, uſe it to make a cup reliſh. *Brambas* is a ſmall round Limon, of much juyce, and a thin ſhell; bearing leaves of an admirable fragrancy when rubbed. The expreſs'd juyce of it, *ſaith this Author*, is ſent into *Europe* not only for a condiment to meat, but alſo for the uſe of *Dying*. The *Anaſſas* is in the Authors Judgment ſo excellent a fruit, that he thinks it cannot be ſufficiently commended, for its pleaſingneſs, both to the Eye, Taſt and Smell, inſomuch that he little ſcruples to affirm it to be the beſt Vegetable production of the Earth; obſerving, that the Engliſh at *Capo Corſo* call it the Pine-apple, and that it grows to the bigneſs of a Melon, changing its greeneſs into an Orange-colour when ripe. The taſt of it ſweet-piquant.

Speaking of their *Fiſhery*, he reckons up many ſorts of Fiſh, they are ſtored with, among which are the *Dorado*, *Bonito*, *Oyſter*, and *Eſſua* or *Tubaron*; of which latter ſort he obſerves, that they emit no ſeed into the water, but couple together like Whales, he having ſeen a *Female-Tubaron* taken, and ſix or ſeven of her young ones cut out of her belly.

They have Oxen, Cows, and Goats, but they are no good meat; yet their Sheep well-taſted, but very dear. *European* Hoggs, Geeſe, Ducks and Hens will not thrive there. They abound in Deer, Tigers,

gers, Porcupins, Civet-cats, which latter the more they are fed with pulſe of meal and honey, the more Civet they yield.

Diſcourſing of their *Salt*, he takes notice, that they let in Sea-water, which having ſtood a while,is in great Earthen veſſels put over a great fire, and boyled to Salt, which they let dry in the Sun, often ſtirring it; whereupon 'tis found both ſo ſtrong and white, that 'tis inferior to no European Salt whether in taſt or whiteneſs.

Speaking of the Commodities,bought of the Europeans by thoſe of *Fetu* and their Neighbours of *Acania*, he obſerves, that they are by Slaves carried to *Aſſingrud* in *Acania*, and from thence through *Alance* to *Accabel*, which he ſaith is another and a potent and opulent Country, twelve dayes Journey behind *Acania*, and that very Country, wherein are thoſe rich *Gold mines*, out of which comes the moſt and beſt Gold, for which the European Commodities are brought, *&c.*

II. *The firſt Book of the ART of METTALS, written in* Spaniſh *by* Alonſo Barba, *&c. and Engliſht by the R. H.* Edward *Earl of* Sandwich. London, 1674. *in* 8°.

THis Piece being originally written by one, that had lived a conſiderable time in *Peru* at *Potoſi*, and having been thought worthy to be Engliſht by ſo noble and intelligent a perſon, as the late Earl of *Sandwich*, we cannot but take notice and give ſome account of it to the Curious in this argument; paſſing by thoſe particulars that are obvious and common, about the aſſociating ſubſtances of Mettals, (ſuch as Stones, Earths, Juyces,) and their various qualifications, and confining our ſelves to thoſe that are leſs ſo, *viz.*

1. *That* the Provinces of the *Weſt-Indies* do as much abound in *Salt*, as they do in *Mettals*; *that* a piece of the Sea between the *Lipes* did coagulated into a Cryſtallin Salt; *that* the Salt-pits, call'd *Garci Mendoza*, are forty leagues long, and (where narroweſt) ſixteen broad; *that* in the *Lipes*, four leagues from the Mines of St. *Chriſtopher de Achocolla*, in the middle of a Lake, on the top of a Hill, the water boyling up, there is one ſmall gutter, where it running over, the water iſſued forth becomes red Salt, as it runs along in little channels, and proves a mighty ſtrong Salt,having double the vertue of common Salt in the working of Metals. Which Salt being an excellent remedy for the Dyſentery, 'tis thought to have a mixture of a kind of red Allum, found alſo in thoſe parts.

2. That that Sulphureous liquor *Naphtha* and *Petreolum* will take fire at a great diſtance from the flame; here confirm'd by a ſad

inſtance, in which it came to paſs, that a Nobleman, having a Well in his ground, the water whereof was mixed with *Petreol*, and much of this water, by ſome cracks in the wall, running to waſte, commanded it to be repaired by a labourer, who being let down into the bottom of the Well with a candle (in a Lanthorn,) to ſee this work, the *Petreol* immediately through the holes of the Lanthorn ſuckt, (as they ſpeak) the flame to it ſelf, and ſet fire on the whole Well, which inſtantly diſcharg'd it ſelf like a piece of Cannon, and blew the poor man into pieces, and took off an arm of a Tree hung over the Well.

3. That, though *Albertus M.* and others do think, *Marcaſites* contain no mettal in them; yet Experience has taught the contrary; ſeeing that the diggers of the Mines of *Monſerrat en los Chichas* found the Oar to contain as much Silver as it did of Marcaſite; and that in the Mountain of *Potoſi* there is a fine ſort of this *Marcaſite*, which is incorporated with the black Silver-ore, and is a certain ſign of its richneſs.

4. That where *Orpiment* is found, 'tis a certain ſign of a Mine of Gold, whereof alſo it alwayes contains ſome little particle.

5. That there is a water in *Peru*, near *Guancavelica*, of which all the cattle that drink it dye; and which they take and put into moulds of what form and bigneſs they pleaſe, which being for a few days expoſed to the Sun, is thereby made perfect ſtone, with which they build their houſes: And that in the mountain *Pacocava*, a league from the Mines of *Verenguela de Pacagues*, there are ſprings (that are whitiſh, inclining to a yellow) of ſo petrifying a nature, that as the water runs along, it concretes into very hard and weighty ſtones, of different ſhapes.

6. That there is a ſtone in the province of *Atacama*, that is ſix palmes (or about four foot) in length, and four inches and a half in breadth, and two inches thick; in form like a Table, full of delicate clouds, made by the compoſition of its colors; ſome being red, and ſhining, others more obſcure, as black, yellow, green, and white: Upon the blackeſt ſpot in all the ſtone is reſembled Snow, as 'twere, falling upon it, or Milk, according as the White happens to be mixt with ſhadow.

7. That, whereas concerning thoſe ſtones, call'd *Conchites*, reſembling in their lineaments the Cockles of the Sea, ſome are of opinion, that thoſe Shell-fiſhes lying a long time in a petrifying Soyl, the petrific liquor converted them into ſtone; grounding their opinion upon that other, that the Sea in former times hath overflown ſuch

Land: All colour of reaſon is taken away from that conceit by the wonderful veins of ſtone found in the high-way going from *Potoſi* to *Oroneſta* down the hill; where ſtones are gathered having upon them impreſſions of divers ſorts of figures in them, ſo much to the life, that none but the Author of nature (*ſaith our Author*) could have produced ſuch workmanſhip: Amongſt which ſtones one may ſee (*ſaith he further*) Cockles of all ſorts, with the ſmalleſt lineaments of thoſe ſhells drawn in great perfection; and this place in the heart of all the Country, and the moſt double mountanous land therein, where it were madneſs (as he ſpeaks) to imagine that ever the Sea had there only prevailed and left Cockles only in this one part of it.

8. That abundance of *Brimſtone* in Mines is an eſpecial good ſign of their richneſs: A conſiderable inſtance whereof is the Roſe-colored Ore of the famous mountain of St. *Iſabella* of new *Potoſi*, in the rich Province of the *Lipes*, which is almoſt all Plate, and bred among ſuch abundance of Brimſtone, that the cavities in the rocks are preſently all on fire, if a lighted candle touch them.

9. That the opinion confining the Number of Metals to *Seven* is very uncertain, ſince 'tis very probable, that in the bowels of the Earth there be more ſorts than we yet know; and that in the mountains of *Sudnos* in *Bohemia* there was ſome years ago found a metal, by them called *Biſmuto*, which is a metal between Tin and Lead, and yet diſtinct from them both.

10. That many excellent Mines have been found out by chance, and many others by Art and Induſtry; concerning which latter divers wayes and ſigns are here deliver'd, ch. 24, 25.

11. That from Experience the *firſt* place for riches of metals may be aſſigned to thoſe Veins that run North and South on the North-ſide of the mountain; and that the four principal Mines in the Mountain *Potoſi* do obſerve this point of the Compaſs with a very little declination Weſtward: That from the ſame ground, the *ſecond* place for that abundance may be given to them that run North and South, on the South-ſide of the Hills; the beſt veins of the ſecond famous Mine of that Kingdom, *Oruro*, running parallel to that point of the Compaſs: That in divers places very rich Mines of metal run Eaſt and Weſt, and alſo to ſeveral other points of the Compaſs; ſo that the beſt rule to go by in this matter is, to follow the metal as it diſcovers it ſelf, and to purſue it, as long as one gains thereby or at leaſt ſaves himſelf, becauſe being ſure to looſe nothing one hath, the Vein may lead him to great riches: And if the vein be large, and have any ſigns of Gold or Silver in it, al-

though for the preſent it ſhould not quit coſt, yet men ought to go on couragiouſly with hopes of gaining at laſt great profit; it having been confirm'd by Experience in all the Mines of thoſe Provinces: A freſh Inſtance whereof our Author alledges in the rich Mine of *Chocaia*, where after the Miners had follow'd its Veins fourty years with very little profit, at length they met with that extraordinary riches, as is notorious to all people of that Kingdom.

12. That if the Metal be found clinging about ſtones, and be found likewiſe in the hollows of them in grains like corns of Gunpowder (being that which the *Spaniards* call *Plomo*, and is Silver unrefined,) though theſe grains be but few, and the reſt of the metal have no Silver in it, 'tis nevertheleſs a ſign of the richeſs of the vein, when it meets with more moiſture; as it fell out in that great Mine of St. *Chriſtopher* of the *Lipes*, which they call the *Poor mans treaſure*. If, as they dig forwards, they meet with more abundance of thoſe grains *de plomo*, 'tis a ſign that the rich Ore is very near.

13. That *Carabaya* in *Peru* is a Country ſtored with plenty of the fineſt *Gold*, as fine as the fineſt Gold of *Arabia*, it being of the fineneſs of 23 Carats and 3 grains; which though formerly it hath only been gather'd up in fragments, waſh'd off by rains, yet 'tis now wrought by following the veins of it under ground: *That* the Country *Tipuane*, inhabited by ſavage *Indians*, next unto *Larecaja*, is by many eye-witneſſes reported to be ſo rich in Gold, that thence 'tis call'd *Chacra*, that is, the Farm of Gold; where, in the time of the rains, the boys often pick up gold in the ſtreets in ſmall bits, like apple-kernels: *That* the bounds of *Chayanta* are full of Veins of Gold, and that the River of St. *Juan*, running at the bottom of the Province of the *Chiques*, abounds in the ſame metal, *&c.*

14. That in the circuit of the *Charcas* there is ſuch abundance of *Silver*-mines, that they alone, if there were no other in the world, were ſufficient to fill it with riches; in the middle of the juriſdiction of which ſtands *Potoſi*, ſurrounded almoſt with abundance of rich Mines, whereof that famous one of the *Ingas*, called *Porco*, was the firſt, out of which the *Spaniards* dug any Silver: That thoſe very ancient Mines of *Andacava* are admired by all Miners for their vaſt depth, ſtrange contrivance, and plenty of Ore, which is ſuch that it promiſes continual employment for half the *Indians* of that Kingdom: That the Lake, near to *Tobaco Nunio*, contains ſo much water, as would make a running River all the year long; with which there are driven night and day an hundred Silver-mills,

grinding the Ore gotten from its own banks. The places and names of the many particular Mines of that Country, ſee in chap. 27. and 28.

28. That the Mine, call'd *Oſloque* in the *Lipes* was at the top, in a manner, all *Copper*, & every Spades depth as they dug downwards, the Ore grew more and more rich in *Silver*, until it came to be pure Silver, at the bottom of the Mine, where the water increaſing to a mans height ſtopp'd them from proſecuting its further richeſs: *That* there are many Mines of *Copper* in theſe Provinces, and that the bottoms of all the Mines, out of which Silver hath been taken, have been found to yield great ſtore of it; ſo that, how many Silver-mines there are, ſo many Mines there are eſteem'd to be whence Copper may be got alſo.

16. That thoſe Provinces are not deſtitute of *Iron*; though none employ their labour to ſeek it out or work it, becauſe there is ſuch abundance of Silver that ingages their induſtry. The places and names of divers *Iron*-mines in that Country are particularized chap. 30.

17. That there hath been no Silver-mine diſcover'd in all that Kingdom, wherein ſome *Lead* hath not been found; which metal is rarely found mingled with Gold, moſt commonly with *Silver*, and ſometimes with *Copper*.

18. That *Tin* alſo is not wanting in thoſe rich Provinces; there being a Farm of Mines, nam'd *de Colquiri*, not far from the hill of St. *Philip de Auſtria de ORURO*, which is famous for the abundance and excellency of *Tin*, gotten there, wherewith they have furniſh't all that Kingdom. See other *Tin-mines* marked ch. 32.

19. That the *Quick-ſilver*, come to *Potoſi* for collecting the Silver out of the Ore, and regiſtred upon the King of *Spain*'s account *A*. 1574. and from that time till 1640, amounted upwards of 204600 quintals, beſides a vaſt quantity brought in upon other accounts: *That*, to ſupply the exceſſive expence of this Mineral, they have diſcover'd the famous Mine of *Guancabellica*; and that there are other Quick-ſilver mines in the Provinces ſubject to the *Charcas*, and in *Challatiri*, and near to *Guarina*, &c.

There is a *ſecond* book annexed to the firſt; about the Refining of Silver by Quick-ſilver; which we muſt refer to another opportunity.

III *The* **ROYAL** *ALMANACK*,&c. *by* N. Stevenſon, *one of his Majeſties Gunners.* London, *for* 1675. *in* 12°.

THis full and very ingeniouſly contrived *Diary*, contains *firſt* the true Places of the Sun, Moon, and other Planets, together with their Riſing and Setting. *Secondly*, the *High-water* at London-bridge, with Rules to ſerve other places after the *New Theory* of Tides, and Directions of that knowing and public-minded Gentleman Sir *Jonas Moore*, Kt. *Thirdly*, the Eclipſes; as alſo the Tables of the *Suns* Riſing, *Moons* Southing, *Moons* Riſing and Setting. *Fourthly*, the Moons and the other Planets *Appulſes* to the Fixt Stars for the *Meridian* of *London*, procur'd from the Learn'd and Induſtrious Aſtronomer, Mr. *John Flamſted*, here deliver'd in *Latin* (as the like have been done by the ſame for ſome former years, and were then inſerted in theſe Tracts,) becauſe it may alſo be of uſe to Strangers abroad; who are deſired to impart their Obſervations of this nature to Mr. *Hook*, Profeſſor of *Geometry* at *Greſham-Colledge*, or to one of the Secretary's of the *Royal Society* in *London.*

Advertiſement.

Having already given an account both of *Antonii le Grand* his *inſtitutio Philoſophiæ ſecundùm principia R. des Cartes*, and of Mr. *Kerſey*'s Body of *Algebra* in Engliſh: of the one, in *Numb.* 80; of the other, in *Numb.* 90. and 91, of theſe Tracts: Theſe are to give notice, that the former is now reprinted with many and very conſiderable additions, for Mr. *Martyn* at the *Bell* in St. *Paul*'s Church-yard; the other, finiſh't, in all its four Books; much commended by competent Judges; and to be had at the ſame Shop.

Errata in Numb. 107.

P. 151. l. 19. r. *Salt as when.* p. 154. l. 23. r. *cenſure with an.* p. 166. l. antepen. r. *Urine* for *Wine.* p. 168. l. 20. r. *Numb.* 106. for *Numb.* 126.

Errata in this Numb. 108.

Pag. 174. l. 5. r. *or their.* p. 178. l. 12. r. *a meer phantaſme.*

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society.* 1674.

Numb. 109.

PHILOSOPHICAL TRANSACTIONS.

Decemb. 14. 1674.

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A Relation of a very odd kind of Bleeding in a little Child. Some Queries and Anſwers relating to an Accompt given in Numb. 54. *of a ſtrange Lake in* Carniola. *A Narrative of ſome Obſervations made upon ſeveral Voyages, undertaken to find a* North-Eaſt Paſſage; *together with Inſtructions given by the* Dutch Eaſt-India Company *for the diſcovery of the famous Land of* Jeſſo *near* Japan. *A Relation about a* North-Weſt Paſſage. *An Accompt of three Books. I. A Diſcourſe made before the* Royal Society, *Novemb.* 26. 1674. *concerning the Uſe of DUPLICATE PROPORTION, in ſundry important Particulars; together with a New Hypotheſis of ELASTIQUE or Springy Motions, By Sr.* William Petty *Knight, Fellow of the ſaid* Society. *II. The ſecond Book of the ART of METTALS, &c. written in Spaniſh by* Alonſo Barba, *and Engliſh't by the late Earl of* Sandwich. *III. Animadverſions on the Firſt part of the MACHINA COELESTIS of the deſervedly famous* Johannes Hevelius; *together with an Explication of ſome* Inſtruments; *made by* Rob. Hook, *Geom. Prof in Greſh. Coll. and* Fellow *of the* R. Society.

A Relation ſent Novemb. 16. 1674. *from a very credible and ingenious Perſon, Mr.* Samuel du Gard, *Rector of* Forton *in* Shropſhire, *to Dr.* Ra. Bathurſt *Vice-Chancellor of the Univerſity of* Oxford, *and by him communicated to a Friend of his in* London; *concerning a ſtrange kind of Bleeding in a little Child.*

I Am bold to give you a Narration of the Diſtemper of a Child at *Lilleſhall*, a little Town in *Shropſhire*, becauſe it is very unuſual, (if ever the like hath been heard by you before;) and alſo becauſe I have certain evidence of the thing. The Child was a quarter of a year old, when it was taken with a Bleeding at the Noſe and Ears, and behind the hinder part of the Head, where was nothing at all of any Sore. This laſted for three days; at the end of which, the Noſe and Ears ceaſed bleeding; but ſtill blood came, as it were ſweat, from the Head. Three days before the death of the Child (which was the ſixth day ſince ſhe began to bleed) the blood came more violently from her Head, and ſtream'd out to ſome diſtance from it: Nor did ſhe bleed only there, but upon her Shoulders, and at the Waſt, in ſuch quantities, that the linnen next her might be wrung, it was ſo wet; and every day required clean linnen. She for three days bled alſo at the Toes, at the bend of her Arms, at the Joynts of her fingers of each hand, and at the fingers ends; and in ſuch meaſure, that in a quarter of an hour the Mother hath catch't from the droppings of the fingers, almoſt ſo much as the hollow of her hand would hold. All the time of this bleeding the Child never cryed vehemently, but only groan'd; though about three weeks before, it had ſuch a violent fit of crying as the Mother ſaid ſhe never heard. After the Child was dead, there appear'd, in thoſe places where the blood came, litle holes like the prickings of a Needle.

This Accompt I had from the Mother of the Child, who is a very ſober Woman; and ſhe told it me with tears. Every circumſtance is ſo far from fiction, that the Women, who were many, that were with the Child in its illneſs and at its death, do atteſt it. I ſaw the Child's Coat ſtained, at the waſt of it, with the blood that came from that part; and alſo another thing bloody from the head of it. The Mother told me, the blood was not thin like water, but of that thickneſs as blood uſually is; and that ſhe and others believed, there was little or no bloud left in the body of the Child. If the time of the Child's death will add any thing to this Relation, it was about laſt Candlemaſs.

Some Queries and Anſwers, relating to an Account given in Numb. 54. *by Dr.* Edw. Brown, *of a ſtrange Lake in* Carniola, *call'd the* Zirchnitz-Sea: *The Queries were made by a Curious perſon in* France; *the Anſwers given by the Author of the ſaid Accompt.*

1. Q. *WHether the Mountains that compaſs this Lake, except on the South-ſide, be very high, and whether the Snow keep long upon them?* A. This Lake is encompaſſed with *high* hills at ſome little diſtance, but when I was upon the Lake, I ſaw no Snow upon them; but upon Mountains in the Country, as I travell'd to and from this Lake, I obſerv'd Snow in *June.* Upon Hills on the ſide of great Lakes the Snow lyes not ſo long as upon hills more diſtant.

2. Q. *Whether the Holes and Openings, by which theſe Waters run out, are in ſtones, or in the looſe Earth?* A. Generally they are ſtony, not in ſoft or looſe Earth; yet in one or two places the Earth hath been known to ſink and fall in, particularly near a Village call'd *Sea-dorf.*

3. Q. *Whether theſe Holes be the ſame every year, and whether no New ones are made?* A. The great Holes are the ſame every year; but poſſibly part of the water may ſometimes find or make new paſſages through the crevices and cribrous parts of the Field.

4. Q. *Whether they have not ſearched into theſe Holes, and do not ſee the water at the bottom of theſe holes, or in wells, at the time when this Lake is diſcharged of the greateſt part of its water?* A. They have ſearched into theſe holes, and when the water goeth firſt away, they ſee it in them for a while, but afterwards it deſcends lower out of their ſight.

5. Q. *Whether, when the water is deſcended in* June *into thoſe Holes, there remains none of it in this Lake in places* above *thoſe holes?* A. There remains at that time no water, at leaſt not any that is conſiderable for any time in places more elevated than thoſe holes, moſt of it draining away towards the holes in the Valleys; the reſt is either imbibed by the Earth, or, if any remain in the hilly or rocky part, it is evaporated.

6. Q. *Whether there be not thereabout ſome River, or Snow, or Ice, that may furniſh this Lake with the water that returns into it in* September? A. The Snow falls not till after the Lake is return'd. There are divers conſiderable Rivers in the Countries about this Lake; but theſe furniſh not this Lake, but run a contrary way. And I could not learn, whether theſe Rivers did increaſe or decreaſe upon the deſcent or return of the water of this Lake.

7. Q. *How thoſe that take the Fiſh at the return of the water, can remain at the place of the holes, when the water comes to riſe high and with force?* A. I affirm, not that they take the Fiſh when the water aſcends, but when it deſcends. For, beſides that the water ſpreads ſpeedily, the Prince of *Eckenberg*, who is Lord of this Lake and the parts about it, will not permit them at that time to make any ſuch attempt, expecting to have the Lake repleniſht again with the Fiſh without diminiſhing them.

8. Q. *Of what bigneſs are thoſe Holes, and whether the openings of them are perpendicular, or ſide-wayes?* A. The Holes are of different largeneſs and figure; ſome perpendicular at the beginning, and then oblique; others oblique at firſt; ſcarce two exactly alike. Such holes I have ſeen in other parts of *Carniola*, and in other Countries alſo. We have a Hole call'd *Elden-hole*, not made by art, but naturally in the mountain, in the Peak-country of *Darbyſhire*, above 80 fathoms deep.

9. Q. *How much the Water aſcends in* September, *and in what*

ſpace of time? A. The water aſcends ſo plentifully, that it fills the Lake in a ſhort time, eſpecially the Valleys; and the hole in as ſhort a ſpace, as a Field of about two leagues long and one broad can well be filled; but I cannot determin it to a day: For, ſome years the water ariſeth ſo plentifully, that it fills all about *Niderdorf*, and almoſt to *Zirchnitz.*

10. Q. *Whether the water returning is turbid or clear?* A. The water that ſpouts ſeems ſomewhat clear in the Air, but being ſpread about, looks as formerly in the Lake.

11. Q. *Whether the water being all return'd in* September, *remains until the month of* June *following at one and the ſame hight?* A. The water is not alwayes at the ſame highth, but ſomewhat differing according unto rains, ſnows, or drought; and they are ſenſible of its highth by the tops of the hills in it and its ſpreading towards *Zirchnitz*; but it alters not very much till it begins to go away.

12. Q. *Whether no River enters this Lake; and whether it have no other way of diſcharge but by theſe ſubterraneous Openings?* A. No River enters it, but only inconſiderable Rivolets on the South and Eaſt-ſide; nor hath it any other diſcharge known, but by the holes.

13 Q. *Whether the Scituation of this Lake in reſpect of the neighbouring Country be not very high?* A. The Country is high about the Lake, but the Lake is not high in reſpect of the Country near it, but low. Travelling from this Lake towards *Idria*, a place noted for Quickſilver-mines, I found the Country mountanous; there are Mountains between it and *Iſtria*, and between it and the Sea; there are Mountains in *Dalmatia*, and alſo towards *Croatia*, and upon divers Mountains in other Countries there are waters repleniſht with Fiſh, as upon mount *Cenis.*

14. Q. *Whether there be not ſome neighbouring Hills, the laſt Ice of which melting in* June, *may open a paſſage to the water of this Lake, and which beginning again to freeze in* September, *may ſtop again the paſſage, and force the water to return into this Lake?* A. I did not hear of any Mountain near it, the Ice of which melting might open a paſſage to the water of this Lake; but probably this Lake may hold dependance of, and communication with ſome ſubterraneous great Lake or Magazin of water belonging to theſe Hilly regions, which when full, and running over, may vent it ſelf with force and plenty into this field, and when ſcant of water, abſorbe and drink-in the ſame again; the water of the Lake returning but from whence it came, having no River running out of it, whereby to be diſcharged,

15. Q. *Whether this Lake freezeth, and whether it hath many fountains on its banks or comming from near hills?* A. It freezeth in the Winter like other Lakes: So the Fiſhes of this Lake have a cloſer habitation than thoſe in others; for they are under the Ice a part of the Winter, and under the Earth a part of the Summer.

16. Q. *What changes the Fiſhermen find on that ſtone they call the* Fiſher-ſtone, *thereby to conjecture the time when the water is to run away?* A. That which they call the *Fiſher-ſtone*, is a large ſtone upon one of the Hills or elevated parts of the Field, which whenſoever it appears above water, the Fiſhermen, being upon the Lake, take notice of it, and know thereby, that in a few dayes the water will retire under ground. For, after the filling of the Lake in *September*, the water never decreaſeth ſo low again, as to let the *Fiſher-ſtone* appear till it begins to retire underground.

A Narrative of ſome Obſervations made upon ſeveral Voyages, undertaken to find a way for ſailing about the North to the Eaſt-Indies, *and for returning the ſame way from thence hither: Together with Inſtructions given by the Dutch Eaſt-India Company for the Diſcovery of the famous Land of* Jeſſo *near* Japan. *To which is added a Relation of ſailing through the* Northern America *to the* Eaſt-Indies. *Engliſhed by the Publiſher out of* Dutch, *which had been compos'd by* Dirick Rembrantz van Nierop, *and printed at* Amſterdam 1674. in 4°.

AMongſt the ſeveral wayes, by eminent Navigators thought upon, for ſailing to the *Eaſt-Indies*, that ſeems not the leaſt conſiderable, which hath been propoſed and attempted to be perform'd by the North-Eaſt. *William Barentz*, an experienced Pilot and ſtout Seaman of the Neatherlands, in his Voyages of the Year 1594. and 1596, ſailed Northward as far as to 77°. 20′. with an intention to have turn'd to the *North-Eaſt*, until he ſhould by eſtimate find, he had in that courſe advanced far enough to change his courſe into that of *South-Eaſt* or South, and ſo to diſcover *Chinay*, *Catay*, or *Japan*: But he was diverted from this purpoſe by his company, though he perſiſted until death in that opinion of his, *viz.* that that way of ſailing far to the North of *Nova Zembla*, where there was a ſpatious Sea, free from Ice, and leſs cold than at a more Southerly Latitude, was the moſt probable way of diſcovering the *Eaſt-Indies* on that ſide of the World.

Upon this Suppoſition divers Voyages have been attempted with the like intention: And though hitherto the Attempt hath been made that way, only from the ſide of *Europe*; yet that famous Seaman,

man, *Joris van Spilbergen*, would have adventured a Voyage the ſame way from the ſide of the *Eaſt-Indies*, if with much importunity he had not been diſſuaded from it.

And though we have not yet heard of any that hath actually undertaken ſuch a Voyage; yet ſomething hath been done, whence ſome eſtimate may be made of the condition of thoſe parts. For, it having been taken for granted, that to the North or North-Eaſt of *Japan* there is found a large ſpacious Sea, and the *Japoneſes* having been heard to talk much of a Country called *Jeſſo* or *Eſo*, but believing it to lye to the North-weſt of *Japan*, on the Coaſt of *Catay* or *Tartary*, and this Kingdom of *Catay* being much celebrated for its opulency and ſhipping; the Council of the Dutch *Eaſt-India* Company at *Batavia*, in the Iſland of *Java*, gave *A.* 1643. very particular Inſtructions to *Martin Geritſen Vries*, Captain of the Ship *Caſtrikum*, ſet out to diſcover the unknown Eaſt-coaſt of *Tartary*, the Kingdom of *Catay*, and the Weſt-coaſt of *America*, together with the Iſles ſcituate to the Eaſt of *Japan*, cryed up for their richeſs in ſilver and gold. Thoſe Inſtructions containing many particulars that are not ordinary, we ſhall not ſpare our labor of giving them here in Engliſh, out of the above-nam'd *Rembrantz of Nierop*.

1. Amongſt the beſt Geographers, *Tartaria* is reckon'd to be one of the greateſt parts of the World, having in longitude, or from Eaſt to Weſt, no leſs than 60 degrees, and in latitude, or from North to South, about 30 d. And of the many vaſt Countries, which it comprehends, *Cataya* is eſteem'd the moſt excellent, lying in a temperate Climate, in about 50 d. Northern latitude, and being the prime Province of the Empire of the great *Cham*, who keeps his Court in the *Metropolis* thereof, call'd *Cambalu*, famous for mighty commerce and trade driven there from all *Tartary* and *China*.

2. The Eaſt-Coaſt of this Country is much famed for Shipping, by reaſon of the great traffick ſaid to be uſed from thence to all the parts and coaſts thereabout. Yet becauſe it lyes in a corner of the World that is much out of the way; neither the *Europeans*, nor any *Oriental* Nation, no not the bordering *Chineſes* themſelves, have hitherto been able to obtain any commerce with them.

3. The fame of this *Cataya* hath excited many brave Pilots to point out and deſign ſeveral ways thither, as well by the Eaſt-Indies, and the Straights of *Magellan*, as by the Northern *America*, and round about *Nova Zembla*, and even directly through the *North-Pole*. Whereupon alſo by the three laſt ways divers attempts have been

made both by Engliſh and Dutch, but in vain; as were alſo the two Voyages of 1594 and 1595, deſcribed by *Linſcoten.*

4. Since that time, nothing hath been attempted for *Cataya*, neither by the North, nor the Eaſt or Weſt-Indies, till the year 1639, when two Dutch Ships, under the Command of Captain *Matthias Kwaſt*, were ſet out to diſcover the Eaſt-Coaſt of the Great *Tartary*, eſpecially the famous Gold and Silver-Iſlands; though, by reaſon of ſeveral unfortunate accidents, they both return'd *re infectâ.*

5. Notwithſtanding which, the Dutch, being ſufficiently poſſeſs'd with the perſwaſion of the advantages of that diſcovery, perſiſted in ſetting out other Veſſels, namely the Ship *Caſtricum*, and a good big Yacht: In the doing of which, after they had conſulted that experienced Pilot, *Francis Jacobſen Viſſer*, and divers others, who, for the diſcovery of *Tartary* and the Iſlands to the Eaſt of *Japan*, adviſed them to take their courſe between *Japan* and *Corea*; they, being aware of the uncertainty of a good paſſage that way, and of the danger of many ſhelves and rocks there, concluded at laſt to ſail to the Eaſt without *Japan* through the main Sea, as the ſafeſt courſe, eſpecially it being very probable, that by reaſon of the Climate of 40 deg. Northwards, in the *Tartarian* Sea, they would not be hindred by any *Mounſons*, but find variable winds like thoſe in *Europe.*

6. The ſaid Captain *Vries* then was order'd to put to Sea from *Ternate* about the firſt of *April* or ſooner, and, when he ſhould have been come without *Gilolo*, to ſteer his courſe North-Eaſt-ward, with the variable winds, which at that ſeaſon do commonly blow in thoſe parts, whereby he would be carried to the 10th. or 15th. degree of Northern latitude, and there ſtop't at about the South-Eaſt, when and where he ſhould ſail by little and little ſomewhat more Northerly, through the main Ocean, to the Eaſt-Coaſt of *Japan*, that ſo he might get ſight of the Land at about 37 degrees; not at all minding the Iſles of *Ladrones*, or others, which perhaps they might approach unto.

7. That, having thus made the Eaſtern-Coaſt of *Japan* about the 20th. or 25th. of *May*, they ſhould from thence ſteer their courſe, in ſight of Land, North and North-Weſt, until the ſaid Coaſt ſhould fall more Weſterly to them; that ſo, by the by, they might learn, how far the utmoſt part of *Japan* to the North did reach, and whether in ſuch a courſe they ſhould make, or get ſight of, that Land which the *Japoneſes* call *Jeſſo*; as alſo, whether that very *Jeſſo* be the Land of *China* or *Tartary*, or elſe a Country ſcituate between both, or an Iſland: Yet that in this they ſhould not ſpend too much time, but be

careful,ſo long to purſue their courſe North-Weſt-ward,until they ſhould diſcover the Coaſt of *Tartary* or *Catay*, endeavouring to do this as much Southerly, as the Wind and the ſaid Land of *Jeſſo* would permit ; which was hoped by the Directors would be done between 40 and 45 deg ; where-about they ſhould ſail along that Coaſt North-ward, or according as the ſame ſhould trend, until they ſhould diſcover the River *Poliſangi*, the *Catayan* Sea-Towns, *Jangia*, *Brema*, or ſome ſuch Bay, Haven or River, wherein their Veſſels might ſafely lye at anchor, and where they might meet with People, to enquire into, and in a little time learn, the condition of the Country.

8. That, if they ſhould thus far ſucceed well, 'twas probable, they would meet upon the Coaſt of *Catay* with Ships ; conſidering that moſt Geographers eſteem not only the Coaſt of *Tartary*, but alſo the neighbouring Ocean to abound in Shipping, and ſpeak of great commerce and trade driven there with the circumjacent Countries and Iſlands: Which if they ſhould find to be ſo, they ſhould take very great care of obliging thoſe People, to learn of them the particulars of their Sea-Voyages, and where the principal Ports and Trading Towns, but eſpecially the River *Poliſangi* and the Town *Jangia*, were ſcituate. And theſe Directors hoping, that they would diſcover one or other place inhabited about the 15th. or 20th. of *June*, they ſhould be diligent and accurate in marking all the Coaſts, Promontories, Bays, Courſes of Rivers, Tides, *&c.* and that in as ſhort a time as poſſibly they could, the ſaving of time being of great conſequence in this matter.

9. That there they ſhould take particular notice of the nature and condition of the people, whether barbarous or any way civilized ; what Commodities the Country aforeſaid and the Inhabitants wanted and deſired : And in caſe theſe people did ſhew any Gold or Silver, they ſhould learn, whether thoſe Mettals were in great value amongſt them, and if they were, they ſhould not ſeem to care much for them, in the exchange of their Commodities for them, and that they ſhould alſo ſhew them Copper, Tin, Lead, &c. making as if theſe Mettals were of a much higher value in our Country, than theirs. Next, they ſhould endeavour to learn the Bigneſs of this Country ; what Cities, Towns, and Neighbours it had ; where the City of *Cambalu* was ſcituate, its dimenſions , government, trade, religion, whether Mahumetan or Pagan ; and particularly, whether the Great *Cham* were their Governour ; what wars they were engaged in, or liable to ; what things or commodities

their Prince and the People themſelves did delight in; and thereupon to enter with them into a Treaty of friendſhip and trade.

10. That, theſe things being diſpatch't in *Tartary*, they ſhould, about the end of *July* or the beginning of *Auguſt*, take leave there with all reſpect and kindneſs, and ſet ſail, taking their courſe croſs the Tartarian Sea, South Eaſt-ward, to the Longitude of the Eaſt-end of *Japan*, or the Weſt-coaſt of the *America incognita*, about the *Cabos de Fortuna*, *Corrientes*, or *Mendoſina Falſi*, which Land, if the weather and wind would ſuffer them, they ſhould labour to diſcover: And from thence they ſhould purſue their courſe directly South-ward to the Eaſt-corner of *Japan*, making that land at about 37½ deg; where they made account they could be about the 20*th* or 25*th* of *Auguſt*. And here they hoped they would diſcover the Iſland ſo rich in Gold and Silver, the detection of which had been endeavoured, though in vain, by Captain *Kwaſt*, *A.* 1639; the ſubſtance of whoſe Journal (which might ſerve them to avoid his errors) together with the writings of the Merchant that was with him, repreſenting the condition and the diſcovery of the ſaid Iſland, was, as follows:

11. That in the South-ſea, at the 37½ deg. Northern Latitude, and about 400 Spaniſh, or 343 Dutch, miles, that is, 28 deg. Longitude Eaſt of *Japan*, there lay a very great and high Iſland, inhabited by a white, handſom, kind and civilized people, exceeding opulent in Gold and Silver, as had been experimented many years ſince by a Spaniſh Ship ſailing from the *Manilles* to *New Spaine*; inſomuch that the King of *Spain* in the Year 1610, or 1611, for further diſcovery, and to take poſſeſſion of the ſame, ſet out a Ship from *Acapulco* to *Japan*; which by ill conduct proved ſucceſleſs: ſince which time the proſecution of that diſcovery had been neglected.

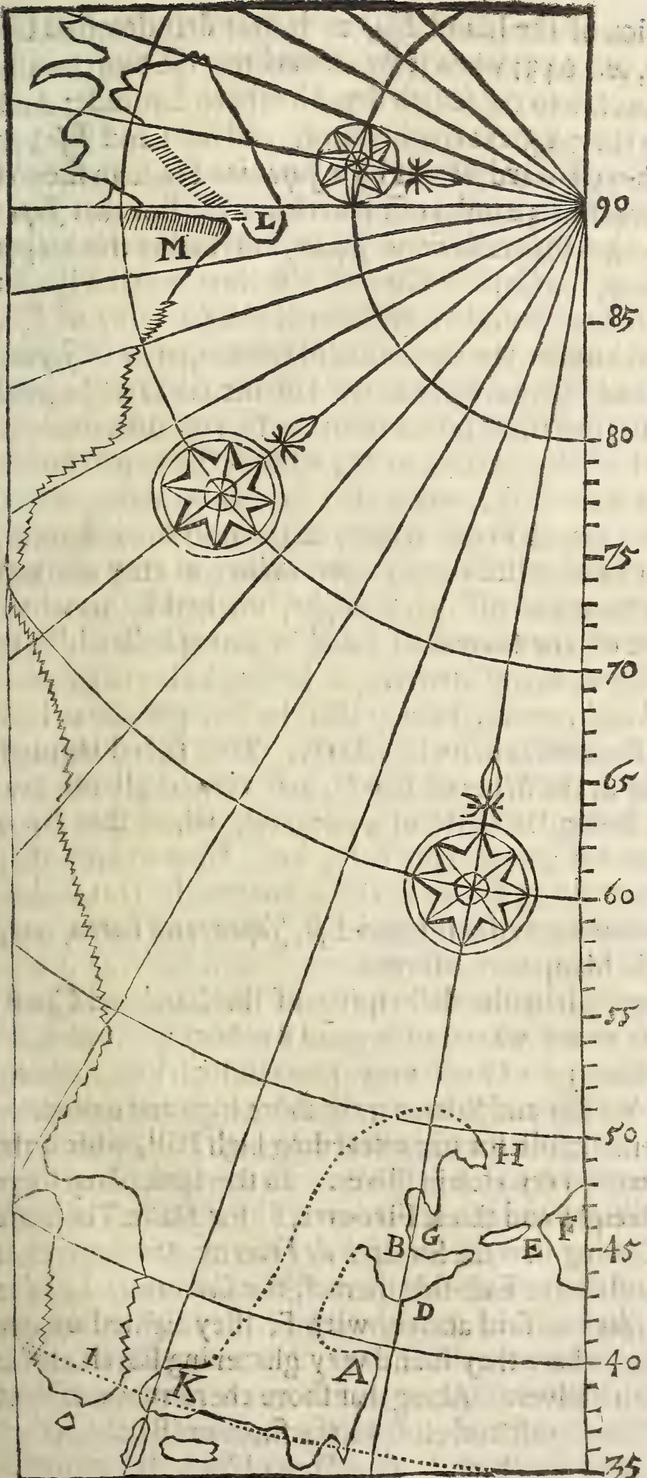
12. And foraſmuch as theſe Directors were from this and other Informations perſuaded, that the ſaid Iſland was ſcituate about the above-alledged diſtance Eaſt of *Japan*, they order'd, that on this occaſion of the *Tartary*-voyage they ſhould reſume the endeavours of this diſcovery, ſteering their courſe from the Eaſt-corner of *Japan*, upon the parallel of 37½ degrees, directly Eaſtward for the ſpace of 350 miles, making what ſail they could in the day-time, and leſſening their ſails at night, that ſo they might not miſs of it in the dark; adding, that if they met not with the ſaid Iſland in that diſtance, they ſhould advance 100 miles further to the Eaſt, that, if ſo they met not with it, they might be aſſured, it was not to be found in the Latitude above-expreſſed, but either more South or more Northward.

13. Having made this point (which by eſtimate they thought might be done about the 20*th* of *Septemb.*) the further direction was, that, according to the condition of the ſeaſon, ſhips, and men, they ſhould after mature deliberation undertake one of the two following wayes, for further diſcovery.

14. The *one*, by taking their courſe from the point aforeſaid (the ſeaſon and wind permitting) back to the Weſt-ward, cruiſing from the 37*th* to the 35*th* degree, to make themſelves ſure, whether that deſired Iſland lay in this way, or in the way of thoſe Iſlands that are ſaid to lye between 30 and 36 degrees, ſome 150 or 200 miles Eaſt of *Japan*, where 'tis held for certain that divers *Japan*-veſſels have been found, and thence carried Silver for *Japan*: But meeting neither with the one nor the other, that then they ſhould ſail more South-weſt-ward to *Formoſa.*

15. The *other*, in caſe the Weſtern wind ſhould not permit them to return to *Japan* by cruiſing in the propos'd Latitude, that then from the aforeſaid point they ſhould ſteer a Northern courſe to the South-weſt coaſt of *America*, above *Capo de Parſelles*, or *Mendoſina*, to come in ſight of *Capo del Agier* on the Coaſt *Triſta*; and, if conveniently they could, get to an anchor in either Bay, where-about Sir *Thom. Candiſh* in the year 1587. in 38 degrees had been at anchor, and named the Land *Nova Albion*; where he took notice, that almoſt no Earth there could be taken up, but there was an appearance of Silver or Gold in it: That therefore they ſhould endeavor to make this Land by the by, to learn ſomething of the condition thereof, and to refreſh the Seamen, and to take-in neceſſary proviſion; which done, they ſhould with a North-eaſt-wind, which in all probability would ſtifly blow there in the latter part of the year, ſail South-weſt-ward as near as they cou'd, and ſo in a right courſe come to diſcover the wiſht for Gold-Iſland, or any of the Silver-Iſlands, between 30 and 36 degrees, ſome 100 or 120 miles Eaſt of *Japan*; and in caſe they miſſed, they ſhould again, as was directed in the firſt way, direct their courſe to *Formoſa.*

16. But, becauſe they had great hopes, they ſhould diſcover the Gold-Iſland by an *Eaſterly* courſe, or at leaſt one of the Silver-Iſlands, by one of the two wayes deſcribed; they gave further inſtruction, what they ſhould do, in caſe of good ſucceſs, for the Service of the Company; which, for the main, ſhould be like to what had been directed on the occaſion of *Cataya*: But beſides, that they ſhould take notice, that theſe Iſlands, in their opinion, would be beſt met with on the South-eaſt-ſide; where, the Gold-Iſland, toge-



ther with a River or Haven, is marked in the *Japonian Beobis* Charte; as may alſo be ſeen in the *Mapp* here joyned. Further, if they made this diſcovery, they ſhould treat the Natives with all kindneſs, ſhew their merchandiſe, ſeem to undervalue Gold, obſerve how they digg it, *&c.*

17. Theſe Inſtructions being thus deliver'd, the Author ſubjoyns the *Event* of this Voyage, as follows: That it was began the ſame year 1643; but the thing found far otherwiſe than was imagin'd; witneſs the Journal of a Voyage, made Eaſt off the Straight *La Maire* to the Coaſt of *Chili*, under the conduct of Captain *Henry Brower*: Where alſo may

be ſeen a deſcription of the Iſland *Eſo*, as it was firſt detected by the ſhip *Caſtricom*, *A.* 1643; when it was found, that the North-eaſt-corner of *Japan* reaches to the fourth deg. Northern Latitude: And inſtead of finding there a great ſpatious Sea, and the Land *Eſo* yet far Weſt or North-weſt-ward, it was by a *Japonian* Sea-man ſhew'd them to lye no more than 30 miles off, North-ward. For that *Japoneſe* made his Voyages for trade from *Japan*, marked in this Mapp with A, to *Mathmay*, the Capital City of *Eſo*, here noted with B: And the ſame related to them the condition of this Country of *Eſo*, *viz.* How that it was under the dominion of the Emperor of *Japan*, and what Towns and Nations were in it. Further, the ſame Journal notes, that this Ship *Caſtricom* ſailed from the North-eaſt-corner of *Japan* to the South-corner of *Eſo*, at D; whence the Land reaches North-eaſt and by Eaſt to E, where they found a Straight, which they called the Straight *de Vries*, which, in the Authors judgment, they ſhould rather have called the Straight *Anian*; as they alſo met with the Land ſcituate Eaſt off this Straight, marked F, to which they gave the name of the *Companies Land*, whereas it ſhould have been call'd the *Weſt-corner of America*, it having hitherto been alwayes ſo placed and named, except that the Straight *Anian* hath been repreſented ſomewhat more Northerly. They ſailed through this Straight as far as the *Sinus* or Bay G, and viewed all the Sea-coaſts as far as H, being the Latit. of 49 degrees, where they ſaw a very high Mountain lying at about 50 degrees, from whence they ſailed back, without doing any more that's known. He that is deſirous to ſee the Delineation of this Land *Eſo*, *Japan*, and *Corea*, may find it on the little Mapp here inſerted.

18. As for a more particular deſcription of this Land and Coaſt, they met generally every where with good Anchoring ground, 20 or more fathoms deep; the Coaſt very plentiful of Fiſh, among which there were Whales and Salmons; the ſhore high and mountainous, eſpecially remarkable for one exceeding high Hill, which the Natives ſignified to be very rich in Silver. In the ſame place there grow very tall, ſtreight and thick Firr-tres, fit for Maſts. The Soile clayie and fat. Coming into the Straight *de Vries* or *Anian*, which is 10 miles broad, and on the Eaſt-ſide thereof, the *Companies Land* in *America*, marked, (as was ſaid above) with F, they lighted on one of thoſe Mountains, where they found very glittering Earth, as if it were abounding with Silver. Along that ſhore there runs a violent ſtream about the North-eaſt, and cloſe to the ſhore are Rocks, which make it very unſafe to lye there. The *States Iſland*, lying over a-

gainſt it, hath alſo high Mountains, and ſeems to be deſtitute of Trees and very ſteep and rocky. The ſhore of the Bay G ſeem'd to be as pleaſant as that of the Engliſh Coaſt, but untill'd; yet naturally ſtored with Mulberries, Grapes, Juniper-berries, Ras-berries; as alſo with Oak, Firr and Birch; the ſhore all along beautified with Roſe-trees. They found alſo abundance of Oiſters on that Coaſt; but met with no wild Dear, nor Mutton, Cows, Geeſe or Hens, though they ſaw many Falcons and Eagles. The Natives are generally all ſhort and thick, very hairy, their brows and lipps painted black or blew, their ears bored thorow, and with ſilver Ear-rings hanging in them. As for their Religion, they gave no other token of any, but that ſitting by the Fire, and drinking, they ſpill thereabout ſome drops on ſeveral places, as if they offer'd to that Element before they would drink. They ſeem'd to be a kind of *Banditi*, maſters all alike. The men have each two wives, of which they are very Jealous. Both men and women love ſtrong drink. Their houſes are of wood, and cover'd with Bark. They have very little Houſhold-ſtuff; Japan-gowns are their beſt ornament, and they have only a few teguments to cover themſelves with in the night. On the ſhore of the Bay G there were ſtarved that winter many people of hunger and cold. Their victuals are, Fiſh, Whale-fat, red Roſe-buds dryed by them for winter-proviſion. They are lazy, not tilling the ground; ſuſtaining themſelves by hunting, ſhooting, and fiſhing. They trade with *Japan*, and their language is mixed with the *Japonian*. They are very ſubtle in trading, but not thieviſh, *&c.*

19. The Event of this Voyage being thus related, the Author proceeds to make ſome Reflexions thereon, *viz.* 1. That the Deſcription given may be of uſe to the *North-Eaſt* Paſſage. 2. That theſe Lands of *Eſo* are very near our *Periæci*, being in the ſame latitude with us, but differing in longitude 180 degrees, having Summer and Winter common with us, but midnight when 'tis noon with us, and *vice verſâ*. 3. That as for ſailing, ſutably to *Joris van Spilbergen*, out of the *Eaſt-Indies* about the North into *theſe* parts, the diſcovery of this Land *Eſo*, which was held to lye *North-Weſt* off *Japan*, whereas it really lyes *North and North-Eaſt* of it, will contribute not a little. For, 'tmay thence be collected, ſaith this Author, that theſe Eaſt-Coaſts of *Eſo* may very well be the Eaſt-Coaſt of *Tartary*; which opinion is much confirm'd by the Deſcription of *Japan*, made by *Caron*, who, upon frequent enquiries made among the *Japoneſes*, was by them inform'd, that the water on the North-Eaſt corner of *Japan*, being 11 miles broad, did reach inwards to the Land *Eſo*,

running againſt mighty mountains about the Province *Oghio*; whereby *Japan* appears to be a firm Land to that of *Eſo*. To which is to be added, what others aſſert, *viz.* That a certain Perſon hath travelled 200 miles North-ward, that is, to about 50 deg. Northern latitude, and found nothing but firm Land. So that, whereas heretofore Geographers were wont to make a large Sea to the North of *Japan*, it has been found by this Voyage of 1643, that the great Land of *Eſo* is ſcituate there; the Coaſts whereof are now made known from 42 to about 49 degrees. But this is not all; for a further Diſcovery came to hand, A. 1668, which was made with a Yacht call'd the *Sparwer*, which the Dutch loſt upon a ſmall Iſle, 12 or 13 miles off of the South-corner of *Corea*, being 14 or 15 miles in compaſs, in 33 deg. 32 min. North-latitude; which Shipwrack hapned Aug. 13. 1653, where the Seamen being taken priſoners by thoſe Inhabitants, there was brought to them one *John Janſen well te Vree*, who A. 1627, had fallen upon the Coaſt of *Corea*, and into the hands of that People, with two more of his Camerades, ſent aſhore to fetch water. This man being then about 58 years of age, had almoſt loſt his Mothers Tongue, ſo that he could hardly be underſtood by his Countrymen; who were in May 1654, tranſported from the ſaid Iſle to the Firm Land of *Corea*, and paſſed through divers Towns, moſt North and by Weſt, to the Court of that King, for the ſpace of 70 or 75 miles, coming to about the 39th. deg. of the Poles Elevation. They teſtifi'd, that *Corea* is ſcituate between 34½ and 44 deg. that is, from South to North about 140 or 150 miles (reckoning 15 of theſe miles to a degree:) The breadth of this Land from Eaſt to Weſt about 70 or 75 miles. On the South-corner 'tis very near to *Japan*, viz. within 25 or 26 miles. On the Weſt-ſide it hath the Coaſt of *China* or the Bay of *Nanquin*, and on the North 'tis by a great Mountain faſten'd to one of the moſt Northerly Provinces of the ſaid *China*; without which it would be an Iſland, there being on the North-Eaſt-ſide an open Sea, where every year divers Whales with Harping Irons in their bellies are affirmed to be found by the Dutch, and other Nations; where likewiſe in the Spring is caught great plenty of Herrings: So that there muſt needs be a thorow-fare between *Corea* and *Japan* to *Nova Zembla* and *Waygatz*. Theſe Dutch men having alſo often enquired of the *Corean* Pilots that ſail to the North Eaſt quarters, whether there was any Land about the North-Eaſt; they had for anſwer, there was nothing but a clear Sea. Theſe ſame men, that were thus caſt away upon the abovesaid Iſle, were 36 in number, of which there eſcaped 8, A. 1666. in *September*, and in a ſmall Veſſel came to *Firando* in *Japan*.

pan, where, ſoon after, they met with their Countrymen at *Nangaſaek*. 4. That from theſe Diſcoveries it may well be concluded to be true, that *Eſo* is joyn'd to *Japan*, as is repreſented in this Map by the pricked lines, but not that 'tis faſt to *Aſia* or *Tartary*. 5. That concerning the particular of having there found Dutch Harping-Irons in the bodies of Whales (which ſeems incredible) 'tis to be conſider'd, that a Whale will ſwim incredibly faſt; and the diſtance from *Spitsberg* to the North-end of *Corea*, being, by the Maps, about 700 miles, a Whale might diſpatch that way in 10 or 12 days, ſwimming in 24 hours about 60 or 70 miles. 6. That this Diſcovery indicates the neareſt way to ſail out of the Eaſt-Indies into theſe parts by the North, *viz.* betwixt *Corea* and *Japan*, here mark't with I and K, which ſpace is at leaſt 25 or 26 miles broad, having a ſtrong current, and entring into a large Sea; the which is much more expeditious, than to paſs on the Eaſt of *Japan* thorow the Straight *de Vries* or *Anian*; and that the rather, becauſe 'tis not yet known, how far that *Eſo* reaches North-ward.

20. This ſmall Map, in which is alſo delineated the North-Coaſt of *Tartary* between *Corea* and *Nova Zembla*, ſuteth with the Globe and Maps of *Petrus Kærius*, I. *A. Kolom*, K. *J. Viſſer*, *Fr. de Wit*, and ſome others, although the two laſt have now alter'd them; for which our Author ſaith he ſees no reaſon.

21. To promote this Paſſage out of the *Eaſt-Indies* by the *North* into *Europe*, it were very neceſſary to ſail from *Eaſt-India* to the Weſt-ward of *Japan*, all along *Corea*, to ſee, how the Sea-Coaſts trend to the North of the ſaid *Corea*, and with what conveniency Ships might ſail as far as to *Nova Zembla*, and to the North of the ſame: Where our Author ſaith that undoubtedly it would be found, that having paſſed the North corner of *N. Zembla*, or, thorow *Weigatz*, * the North-end of *Jelmer-Land*, (marked with L and M, in this Map) one might go on South-Eaſt-ward, and make a ſucceſsful Voyage.

* Compare Numb. 101. of theſe Tracts, p. 3. concerning the true ſcituation of *N. Zembla*.

Some Obſervations concerning a poſſible Paſſage to the Eaſt-Indies by the Northern America *Weſt-ward.*

OF this Paſſage much was at firſt diſcourſed meerly by hear-ſay, as may be ſeen in the Hydrographical Diſcourſe of *W. Bourne*, printed An. 1594. Next, one *Heſſel Gerritſe*, A. 1612. wrote of this Paſſage thus; Since the Engliſh upon the ſeveral Voyages of *W. Barentz* made ſome attempts for the North-Eaſt; the Directors of the Dutch Eaſt-India Company for ſome years laſt paſt ſent thither one *Hudſon*, who not being able to find a Paſſage to the Eaſt, ſailed to the Weſt, whence without effecting any thing he came into *England*. Afterwards, being ſent out again by the Engliſh, A. 1610, and having ſailed 300 Dutch miles and come to the Weſt of *Bakalaos*, and winter'd there at about 52 deg. North-latitude, and deſirous to ſearch further, he was, together with the reſt of the Governors of the Ship, ſet on ſhore by the Seamen, who refuſed to go further, but came home, having been at Sea 10 moneths, whereas they had been victualled but for 8. The hope of this new Paſſage above *Terra nova*, attempted by this *Hudſon*, is ſtrengthen'd by the teſtimony of the *Virginians* and thoſe of *Florida*, who ſolemnly affirm, that to the North-Weſt of their Country there is a great Sea, where they ſay to have ſeen Ships like thoſe of the Engliſh. We read alſo in *Joſ. Acoſta, Ch.* 12. *of the third Book of the Natural Hiſt. of the Weſt-Indies*, that the *Spaniards* are of opinion, the Engliſh Captains, *Drake* and *Candiſh*, had good knowledg of this Paſſage. 'Tis ſaid alſo, that the *Spaniards* ſeek to keep this way undiſcover'd, and that ſome of that Nation, returning from the Conqueſt of the *Philippines*, came home by this very way. King *Philip* the Second therefore cauſed a ſtrong Fort to be built on the upper end of *Mar Vermeio* to the Weſt of *Nova Granada*, to hinder the Dutch and others from invading the riches he poſſeſſeth upon the South-Sea; as we are told for a certain truth. This way therefore if purſued, may direct our People not only to ſail to *China*, the *Moluccas*, and *Peru*; but alſo to go and ſee what People there are on the South-ſide of the South-Sea, *&c.*

Thus far this *Heſſel Gerritſen*: And the ſame year, 1612, ſome attempt was made in proſecution of that deſign, but it proved ſucceſsleſs, becauſe that ſome Land came in the way of the Navigators, which obſtructed their progreſs; as is ſhew'd in the Maps, that were ſince made, where through *Hudſons* Straight you come indeed into a ſpacious Sea, called *Buttons Bay*, but on the Weſt-ſide this is beſet with Land. It ſeems, that Mr. *Hudſon* thought, that he was got thorow it, becauſe he ſo much endeavour'd to get *South-ward*, where at length he was conſtrain'd to winter at the latit. of 52 deg. without effecting any thing. But if he had directed his courſe ſomewhat more *Weſtward*, he might have better got thorow.

An Accompt of three Books,

I. *A Diſcourſe made before the* R. Society, *concerning the Uſe of DUPLICAT PROPORTION in ſundry important Particulars; together with a New Hypotheſis of ELASTIQUE or Springy Bodies: By Sir* William Petty *Knight, &c.*

THE Author of this Diſcourſe, much addicted to apply Speculations to Uſe and Practice, hath given in this Exerciſe of his, *Several Inſtances, wherein the Conſideration of Duplicat and Sub-duplicat Proportion, or the Conſideration of Sides and their Squares is of Uſe in Human affairs.* Thoſe Inſtances are;

1. In the *Drawing or Driving Powers*, which force Ships or other Bodies through the Water, with reference to the reſpective *Velocities* cauſed thereby.

2. In the *Shapes or Sharpneſs of Bodies,* cutting or dividing the Water, through which they are driven or drawn, and in the different Velocities ariſing from thence, where the Bodies and Forces are Equal.

3. In the *Strength of Timbers* , or other Homogeneous materials applied to Buildings, to Carts, or any other Machinaments intended for Strength: And how by a *Model* to judge the Sufficiency of ſuch Engine as is repreſented by it.

4. In the *Effect of Oars* upon Equal and Like Veſſels, according to their Numbers, Length, Blades, and Motions *with* or *againſt* the Stream of ſmooth or un-even waters.

5. In the Motion or *Travelling of Horſes*, on their ſeveral Paces, and with different Burthens on them.

6. In the *Strength* and *Velocity of Mills* and their Wheels.

7. In the effects of *Gunpowder.*

8. In the Diſtance at which *Sounds* may be heard.

9. In the Diſtances at which *Odoriferous matters* may be ſmelt.

10. In the Diſtance at which the *Objects of Sight* may be ſeen.

11. In the Time of the Returns made by *Vibrating Penduls.*

12. In the *Lives* of Men and their Duration.

13. In *Muſical* and *Sounding* Bodies, ſuch as Strings and Bells.

14. In the Effects and Motions of *Fire*, and *Burning Spirits.*

15. In the *Riſing* and *Falling of Bodies*, but eſpecially of Water in *Pumps*, *Over-ſhot Mills*, *Leaks* in Ships, the *Heights of Rivers* at their Head above their fall into the Sea.

16. In *Bellows.*

17. In the *Prices* of ſeveral *Commodities,* as Maſts, Diamonds, large Timber, Amber, Load-ſtones, *&c.*

18. In *Mill-dams*, *Sea-banks*, and the *Bulwarks* or Walls of Fortreſſes.

19. In the *Compreſſion* of *Wool* and other *Elaſtique Bodies*, and of the *Air* within Diving Veſſels, as alſo in the Effects of *Screw-preſſes* upon ſeveral Materials.

Having thus enumerated his ſeveral Inſtances, wherein *Duplicate* and *Sub-duplicate Proportion* is of great importance, he explaines what he underſtands by every material word he uſes in this Diſcourſe, ſuch as *Matter*, *Body*, *Figure*, *Place*, *Motion*, *Quantity*, *Quality*, *Habit*, *Time*, *Proportion*, *Weight*, *Swiftneſs*, *Force* and *Elaſticity*. This done, he falls to his main buſineſs, which is the Application of the ſaid Proportions to each of the reſpective Matters lately mention'd. To which he ſubjoyns an *APPENDIX* touching his new Theory of *Elaſticity*, mechanically explicated, to draw forth the Thoughts of other men for Countenance or Correction. This Hypotheſis the Author hopes will ſolve *all* the Phænomena of *Elaſticity*, and not only ſo, but alſo thoſe of *Hardneſs*, *Fixedneſs*, *Tenacity*, *Fluidity*, *Heat*, *Moiſture*, *Fermentation*, &c. Not to prejudice this his Explication by transferring it hither in a Breviat, we ſhall referr the Curious to the Authors own Diſcourſe; wiſhing, that whatever *Effects* of *Springineſs* do occur to the Ingenious Reader, he would pleaſe to examine them by the Principles deliver'd by the Author.

Theſe are the particulars, perform'd in this Diſcourſe, which the Author judgeth, may paſs for a Sample, *pro tanto*, of what the *Royal Society* is doing. For, the ſaid Diſcourſe conſiſting of three parts, *viz.* 1. An Explanation of the Intricate Notions, or *Philoſophia prima*, of *Place*, *Time*, *Motion*, *Elaſticity*, &c; 2. An excitement of the World to the ſtudy of the Mathematiques, by ſhewing the uſe of *Duplicate Proportions* in ſome of the moſt weighty of Human affairs; And 3. A Propoſal of conſidering, without Chymerical Speculations, ſuch points and properties in *Atomes*, as may give an *Intelligible* Accompt of the Nexures, Mixtures, and Mobilities of all the parts of the Univerſe: The Diſcourſe, I ſay, conſiſting of theſe parts, he eſteems, that in like manner 'tis the profeſſion of the ſaid *Society*, to make Myſterious things plain; to explode and diſuſe all inſignificant and puzling words; to improve and apply little ſmall threds of Mathematiques to vaſt Uſes; and yet not to neglect the fineſt Conſideration, even of *Atomes*, where the ſame is neceſſary.

II. *The Second Book of the* **ART *of* METTALS,** *wherein is taught the Common way of Refining Silver by Quickſilver, with ſome New Rules added for the better performance of the ſame: Written in Spaniſh by* Alonſo Barba, *and Engliſht by the Right Honorable* Edward *Earl of* Sandwich, *London,* 1674. *in* 8°.

THE *firſt* Book of this ſubject was diſcourſed of in the next foregoing Tract. This *ſecond* conſiſts of 24 *Chapters*, moſt of them practical; whereof the *Two firſt* do inſtruct the Reader, *with what care and caution a Refiner of Mettals is to be employed*, and *what knowledge ſuch an one is to be furniſh't with*, viz. that he is to know the qualities and differences of all ſorts of Mettals and Minerals, which of them are moſt proper for Quickſilver, and which for melting; *item,* the Diſeaſes infecting Mettals, and the way of clearing them; as alſo the Accidents of Quickſilver, and the way of Refining both in great and little; and above all, the manner how to make the leſſer Eſſay, by the fire, of Ore ground to powder before the Mettal be incorporated together, that ſo he may certainly know, how much Silver (e.g.) is to be gotten out of the Ore of that Mettal: The want of which knowledge and care, *our Author ſaith*, hath coſt the Kingdom of *Peru* abundance of mony, and is ſtill of great prejudice to it; which he proveth by very conſiderable Experiments, whereby it was made evident, that a Vein of Mettal, eſſayed by the Fire, yielded 900 pieces of Eight the Quintal, which by the ordinary way of Quickſilver yielded but four or five: *item*, that another Mine, which by the common Eſſay with Mercury appear'd to have ſcarce any Silver at all in it; yet by the other way contained 60 pieces of Eight the Quintal.

The *third* Chapt. treats of the *knowledge of thoſe above-intimated differences of Mettals*: The *fourth* teacheth the *way of ſorting Ores, and the proper manner of Refining each of them*: Where 'tis made out, that to eſſay that Mettal by Quickſilver, which requires the fire, is to deſtroy it; as 'tis to looſe the profit, if that Mettal be put in the furnace, which is not to run: And further, though the ſeveral Ores be fit for the Quickſilver, and ſome for Fire, yet even herein they have their differences of being eaſier or harder to be refined, according as they concur or differ in the remedy that is neceſſary to be uſed for that purpoſe.

The *fifth* Chapt. informs us, How to know the ill Qualities that infect the Ore, and how to purge them away: Where 'tis noted, that ſuch Ores, as partake of *Copperas*, will not endure Quickſilver, but conſume and ſcatter it; which our Author ſaith may be eaſily

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tried by mixing a little Quickſilver with well-ground Copperas and Water; whereupon he ſhall in a trice ſee all the Quickſilver diſſolved and loſt, eſpecially putting a little Salt to that compoſition. How this, and other like inconveniences are found out, and how eaſily they may be remedied, may be ſeen in this Chapter at large.

The *ſixth*, *ſeventh*, and *eighth* Chapters, treat of the *Grinding* and Burning of Ore, and the damage that reſults from this Burning. In the buſineſs of *Grinding*, 'tis beneficial to grind the lumps over again, and to grind them very ſmall: To which practiſe our Author adds another way of preparation, *viz.* by Boyling, held by him more proper in all refinings by Quickſilver. As for *Burning*, that is uſeful, not only, that the Ore may grind the better, but alſo that it may be better diſpos'd for the Quickſilver to lay hold on, and incorporate it ſelf with the Silver it contains: which burning yet is not to be uſed in Ores that are mixt with Copperas, the mortal enemy to Quickſilver; the fire not only vanquiſhing, but on the contrary increaſing that ſubſtance; of which therefore all Ore, wherewith 'tis mixed, is firſt to be clear'd by well waſhing it.

The *ninth* delivers ſeveral *Experiments*, *proving the damages by the Burning of Ore*, *if they be not known and remedied.* And the *tenth* examines, *Whether the Ore ought to be burnt in the Stone*, *or in the Meal*; as the *eleventh* aſſigns the *Materials to be mixed with Ore when 'tis burnt*: Where occaſion is taken to repreſent, that the Diſeaſes of Ore may be known by putting a little of it, ground ſomewhat groſs, upon a red-hot plate of Iron, obſerving well what fume it makes; which if it be white or black, it participates of Bitums of that colour; if yellow, of Orpiment; if red, of Sandaraca; if yellow in the middle and green on the outſides, of Sulphur, *&c.*

The *twelfth* and *thirteenth* teach the Refiner what he is to do before he incorporates the † *Caxon* for refining: Where alſo are ſet down the Signs, ſhewing, when the ſeveral Ores, diverſly mixed and handled accordingly, are diſcharged either of all their Sulphur and Antimony, or of their Bitum, and the like; as alſo, when an Ore is well diſpoſed for the Quickſilver, and when not, *&c.*

† That is, *a Cheſt full of Ore ground to be refined.*

The *fourteenth* and *fifteenth* conſider *the nature of Quickſilver*, *and the Cauſes and Differences of the Refiners* Lis *of Quickſilver*, as 'tis call'd, which is Quickſilver divided into very ſubtile parts, which diviſion is cauſed by the often paſſing of it through the Ore although it hath no ill quality at all; but if it hath Copperas in it, it will grind the Quickſilver in great extremity. Now if Quickſilver be without any forain impreſſion upon it, and be diſſolved into *Lis* which is white, 'tis call'd, as was juſt now ſaid, *Lis* of Quickſilver; but *Lis* of other materials is call'd that which is made by Quickſilver of Tin or Lead; and *Lis* of Silver is the fine and ſubtile parts of Silver, made by the repaſſing of the Quickſilver through the Ore, but not as yet joyned and incorporated with it; which when it is, they call it *Pella*, that is, Ball or Pellet. As to the *Nature* of Quickſilver, 'tis a body of ſo admirably uniform a ſubſtance, and of parts ſo perfectly united, that even the fire, which ſeems to be its greateſt enemy, is not powerful enough, by dividing, to corrupt or deſtroy it, as it viſibly doth all other metals and bodies, except Gold and Silver.

The *ſixteenth* examins, *Whether it be fitting, at firſt to put-in all the Quickſilver and other Materials at once, or no?* This Author is for the negative, alledging his reaſons for it, and eſpecially Experience, by which, he ſaith, 'tis found, that the extraordinary cold of much Quickſilver doth accidentally bind up the Ore, and hinder the refining. Which damage, *he ſaith*, follows alſo, if men exceed in the quantity of other materials, they put into the Ore that needs it, becauſe it ſo dulls the Quickſilver, that it will lay hold on no Silver at all; which therefore will very hardly ever be reduced into that condition it ought to be. Yet he advertiſes withal, that if it be needful to refine with *Lime,* his rule will not ſerve in that caſe, but the Lime muſt be put-in all at once, taking eſpecial care, that you do not put in too much of it, becauſe that that greatly hinders the Quickſilver from laying hold of the greater plate.

The *ſeventeenth*, diſcourſes of the *Often repaſſing the Quickſilver through the Ore, and the Effects thereof*: And the *eighteenth* and *nineteenth*, enumerate divers *Accidents, which happen in the way of Refining by Quickſilver, and their Remedies*: Where he obſerves, that if the Quickſilver be very much charged, above what it ought, with materials, ſuch as Lead, Tin, Iron, Lime, it will not appear orbicular, but prolonged like little worms; and if it be ſtirr'd about the Tray without water, it will make drops with little tails, and ſtick to the ſides of the Tray: And when it is of this condition, 'tis a ſign, *ſaith he*, that 'tis killed, or its virtue obtunded from laying hold on the Silver. Which evil how 'tis to be remedied, is at large declared in the ſame Chapters.

The *twentieth* and *one and twentieth*, inſtruct us, *How to know, whether*

whether or no the Caxon be ready for waſhing: And, *that the waſhing of the Caxons cauſeth the loſs and waſte of Quickſilver.* As to the *former*, he ſhews, that no ſmall experience is neceſſary to know that particular; ſince, if the Caxon be not ripe for waſhing, that plate which the Quickſilver hath not laid hold on, is likely to be utterly loſt; or, if it be not, it muſt be ground over again. And here he ſets down a ſure and infallible rule, as he accounts it, for the diſcovery of the diſpoſition of the *Caxon*; reflecting on the rules hitherto deliver'd for that purpoſe. As to the *latter*, he aſſerts, that the immediate cauſe of that miſchief of the Quickſilvers imperceptible getting out of the *Caxon* with the water or the *Lamas*, is, when the Quickſilver is made over-thin without body or weight, as 'twere, ſo that it hath nothing to ſink it to the bottom of the Caldron, and with ſtirring the *Caxon* when they waſh it, it mixes it ſelf with the dregs and dirt, and goes along with them.

The *two and twentieth* ſets down the *True cauſes of the loſs of Quickſilver, and their Remedies.* Where the Author makes the repaſſings to be the remote cauſe of waſting the Quickſilver, and Copperas to be of its own nature, as hath been already noted, a violent cauſe of extenuating the Quickſilver, and of deſtroying the greateſt part that hath been waſted of the ſame. In the working of which ill effect, the Salt, uſed in Refining, and in waſhing the *Caxons*, contributes not a little; as the *Lamas*, mingled with the water, thickens it, and reſiſts the ſinking of the Quickſilver, which ſtayes and is thrown away together with it. See the Remedies in the Author himſelf.

The *three and twentieth* and *four and twentieth*, do explain the *way to make the* Pine-Apples, *and to clear them of the Quickſilver.* When Refiners have taken the Plate and Mercury together out of the Caldron, ſtraining it, to make them the thicker, through two courſe cloaths wetted, and when they have alſo beaten it with a Batledoor to ſqueeſe as much Quickſilver through the cloaths as is poſſible, they make *Pine-apples* of the dry Pellets in moulds fitted for that purpoſe, ſo call'd from their ſimilitude to that fruit, by reaſon of their pyramidal figure: Of which *Pines* thoſe that have been reaſonably well ſtrained, $\frac{1}{5}$ will be Silver; ſo that 100 pounds of Pellets will produce 20 pounds weight of Silver. Here the Author takes occaſion to relate the vaſtneſs of the loſs in clearing the Ore again from the Quickſilver, which he proves from Experience, where by it appear'd, *he ſaith*, in the City of *Potoſi* alone, at the time of his writing, when the Trading in Mettals ran but low, that yet *communibus annis* above *thirty thouſand* pieces of Eight were waſted by the expence of Quickſilver: Which inconvenience hath proceeded, in his opinion, from want of care in ſeeing the Veſſels, uſed in the recovering of Quickſilver, made of good ſtuff, and ſhut very cloſe. Where he takes notice, that at *Oruro*, famous for Gold- and Silver-mines, on the top of a hill there is a little vein of white Earth, whereof they make Veſſels for uſe, which when baked become ſo cloſe and firm that they are not inferior to the beſt *China*, and are very uſeful for the making of Crucibles. But where ſuch Earth is wanting, he directs, that that Clay, which is ordinarily uſed in making the veſſels for recovering the Mercury, be the better mingled with the ſcum or droſs of Iron ground very fine, and ſo made up and baked very well; and that then there ſhall not be ſo much Quickſilver loſt in the uſe of them, as is by thoſe now in common uſe, *&c.*

III. *Animadverſions on the Firſt part of the MACHINA CÆLESTIS of the deſervedly famous Aſtronomer* Johannes Hevelius, *&c. together with an Explication of ſome INSTRUMENTS, made by* Robert Hook *P. of Geom. in* Greſh. Coll. *and Fellow of the Royal Society.* London, *for* John Martyn *Printer to the R. Society, at the* Bell *in St.* Pauls Church-yard, 1674.

THIS Piece conſiſts, as the *Title* intimates, of two main parts. The *One* repreſents the Authors thoughts of the *Aſtronomical Organography* of the Excellent *Hevelius*, both examining *his*, and *Ticho Brahe*'s Inſtruments, and undertaking to evince, that if they had made uſe of *Teleſcopical Sights*, their Obſervations might have been much more exact than they are; foraſmuch as, in the Author's opinion, an Inſtrument of *three* foot *radius* with Teleſcopes, will do more, than one of *ſixty* foot *radius* with Common Sights. The *other* deſcribes an Inſtrument for taking all ſorts of Angles and Diſtances in the Heavens, which, if increas'd in bulk, is capable, ſaith Mr. *Hook*, of as great accurateneſs, as the Atmoſphere will ever permit Cœleſtial Obſervations to be made. Its perfection he places in theſe *ſeven* particulars: 1. In the *Sights*, which are ſuch, *ſaith he*, as may be made to diſcover the minuteſt part diſcoverable in an Object, not at all ſtraining the eye, and fit for all eyes. 2. In the *Diviſions*, which are ſuch, as will diſtinguiſh the Angle as minutely as the Sights wil diſtinguiſh the parts or objects, and that even to *Seconds*. 3. In ſuch a contrivance of the Sights, that with one glance of the eye, both the Objects, though a Semi-circle diſtant, are *at once* diſtinguiſh't and ſeen together. 4. In the Method of ſetting it exactly perpendicular to a *Second*, if need be. 5. In its *Fixation* and *Motion*, it being ſo fixed and moved, that, if once ſet to the Objects, it continues to move along with them, as long as 'tis neceſſary to continue, or be very certain of, any Obſervation. 6. In its being to be made and adjuſted without difficulty, and not to be put out of order without deſign; as alſo in its great eaſineſs of being rectified and again adjuſted. 7. In its being not very chargeable.

All theſe perfections the *Author* explains, and endeavours to make good, by deſcribing and delineating this Inſtrument and all the parts thereof, and endeavouring to obviate ſuch exceptions, as he fore-ſaw might be made againſt it. To all which he annexes occaſionally ſomething that relates to the priority of the Invention of the *Circular pendulum*; and likewiſe a Deſcription of a Wheel-work, which, *he ſaith*, may be called the perfection of ſuch work, having the perfecteſt Idea, he thinks, that toothed Wheel-work is capable of, performing the ſame effect, as if the Wheel and Pinion had an indefinite number of Teeth. Which done, he deſcribes the Frame for keeping the Inſtrument, which is the main Argument of this Book, in its Perpendicularity, and yet always in the *Azimuth* of the Cæleſtial object; with a Digreſſion of the great Uſe of this Principle in Dialling, Equalling Time, Clock-work, *&c.*

He mentions alſo a Mechanical way, he hath, of calculating and performing *Arithmetical* operations, much quicker and more certainly, than can be done by the help of *Logarithmes*.

He concludes the whole by ſhewing divers of the particular Uſes of this New Quadrant, as 1. For meaſuring the Refraction of the Air. 2. For regulating the Places of the Fixt Stars and of the Planets. 3. For ſtating the Latitude of Places. 4. For examining the Influences of the Planets on the Earth. 5. For meaſuring the quantity of a Degree upon the Earth. 6. For meaſuring ſeen Diſtances. 7. For Levelling. 8. For taking the Diameters of the Sun, Moon, and other Planets. Where, by the by, are mention'd two other Inſtruments, one for taking Diameters to *Seconds*; the other, for looking on the body of the Sun without harming the eyes.

Errata left uncorrected in Numb. 108.

Pag. 170. l. 20. r. *Stores of Salt*. p. 185. l. penult. r. *ſometimes to the thickneſs of a ſtem*. p. 187. l. 15. r. *bought*. ibid. l. 30. r. *did coagulate*.

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society*, 1674.

Experiment he tryed, by letting the Sun-beams through a little hole into a dark chamber; which paſſing through a glaſs Priſm to the oppoſite wall, exhibited there a *Spectrum* of divers colours, but in a form much more long then broad: whereas according to the received Laws of Refraction, it ſhould rather have appeared in a circular form. Whereupon conceiving a defect in thoſe uſual Laws of Refraction, he frames his new Theory of Light, giving to ſeveral rays, ſeveral refrangibilities, without reſpect to their Angles of Incidence, *&c.*

Truly, Sir, I doubt not of what this learned Author here affirms; and have my ſelf ſometimes in like circumſtances obſerved the like difference between the length and breadth of this coloured *Spectrum*; but never found it ſo when the sky was clear and free from clouds, near the Sun: but then only appeared this difference of length and breadth, when the Sun either ſhined through a white cloud, or enlightned ſome ſuch clouds near unto it. And then indeed it was no marvel, the ſaid *Spectrum* ſhould be longer then broad; ſince the cloud or clouds, ſo enlightned, were in order to thoſe colours like to a great Sun, making a far greater Angle of Interſection in the ſaid hole, then the true rays of the Sun do make; and therefore are able to enlighten the whole length of the Priſm, and not only ſome ſmall part thereof, as we ſee enlightned by the true Sun-beams coming through the ſame little hole. And this we behold alſo in the true Sun-beams, when they enlighten the whole Priſm: for, although in a clear Heaven, the rays of the Sun, paſſing through the ſaid hole, never make a *Spectrum* longer then broad, becauſe they then occupy but a ſmall part of the Priſm; yet if the hole be ſo much bigger as to enlighten the whole Priſm, you ſhall preſently ſee the length of the *Spectrum* much exceed its breadth; which exceſs will be always ſo much the greater, as the length of the Priſm exceeds its breadth. From whence I conclude, that the *Spectrum*, this learned Author ſaw much longer then broad, was not effected by the true Sun-beams, but by rays proceeding from ſome bright cloud, as is ſaid; and by conſequence, that the Theory of Light grounded upon that Experiment cannot ſubſiſt.

What I have here ſaid, needs no other confirmation than meer experience, which any one may quickly try; neither have I only tryed the ſame upon this occaſion, but near 30 years ago ſhewed the ſame, together with divers other Experiments of Light, to that worthy Promoter of Experimental Philoſophy, Sr. *Kenelm Digby*, who coming into theſe parts to take the Spaw-Waters, reſorted oftentimes to my darkned Chamber, to ſee thoſe various Phænomena of Light made by divers Refractions and Reflexions, and took Notes upon them; which induſtry if they alſo had uſed, who endeavour to explicate the aforeſaid difference between the length and breadth of this coloured *Spectrum*, by the received Laws of Refraction, would never have taken ſo impoſſible a task in hand.

The reſt is, Honoured Sir, that it is far from my intent, that the miſtake here mentioned do any way derogate from that learned perſon: Which truly might have happened to my ſelf, if at my firſt tryal thereof, the Sun had been in a white cloud, as it ſeems, it happened to him. Wherefore ceaſing further to trouble you, I reſt,

Yours to command, *Francis Linus.*
6 Octob. 1674.

An Anſwer to this Letter.

Sir,

THE Letter you thought fit to write by way of Animadverſion upon Mr. *Newton*'s new Theory of Light and Colors, grounded upon an Experiment of letting the Sun-beams through a little hole into a dark chamber, ſeems to need no other Anſwer but this, That you would be pleaſed to look upon and conſider the Scheme in Mr. *Newton*'s 2d Anſwer to *P. Pardies* in *Numb.* 85. of the *Ph. Tranſactions*; and reſt aſſured, that the Experiment, as it is repreſented, was tryed in clear days, and the Priſm placed cloſe to the hole in the window, ſo that the Light had no room to diverge, and the colour'd Image made not parallel (as in that conjecture) but tranſverſe to the axis of the Priſm.

London, Decemb. 17. 1674.

Extracts of two Letters, written by Mr. Flamſteed *to Mr.* Collins; *the* one *of* Novemb. 25. 1624. *concerning an Inſtrument to ſhew the Moons true place to a minute or two; as alſo the Writers's deſign of correcting the hitherto aſſign'd Motions of the Sun: The* other, *of* Decemb. 14. 1674. *touching the neceſſity of making New Solar Numbers, together with an Expedient for making trial, whether the Refractions in Signor* Caſſini'*s Tables are juſt.*

The Extract of the firſt *Letter.*

AFter my return to *Derby*, I fell to peruſe Mr. *Street*'s Diſcourſe, and to conſider the Contrivance of his *Moon-wiſer*; which though *he* affirms in the Concluſion of his little Tract, to be different from Mr. *Horroxes*; yet I can aſſure, that for the *Motion* of *Longitude*, 'tis the very ſame, and no other than what is taken from my Explication; ſave that, where I thought the manner of Librating the *Apogéum* was obvious from the Calculation, and needed not to be explained, he hath ſhewn, how to take it in the Libratory Circle. As for his *Motion* of *Latitude*, indeed that is a little different; but I can again aſſure him, not much better than Mr. *Horroxes*; to whom we are indebted for this Contrivance. Mean time, when he hath done what he can, it will not ſhew the true place to half a degree.

I have therefore thought of another Contrivance, not ſo large, nor troubleſom as his, that ſhall ſhew the Moons true place to a minute or two without error, and with an Inſtrument, no larger than his, to leſs than a ſingle minute.

And becauſe I find by correcting the Suns motions by Signor *Caſſini*'s obſervations, that his Inequalities are 5 minutes leſs in his *mean* diſtance; and that the motion of Latitude needs correction; I ſhall amend both, as I think and find fit, in this Inſtrument; which, with the Place and Latitudes will give the Moons Semi-diameters and Parallaxes to a ſecond.

The Extract of the other *Letter.*

I Think, I have been ſince my laſt a little better employed than before. I found it neceſſary, to make New *Solar* Numbers, becauſe in my old I had neglected to apply *Refractions* in all the Altitudes above 30 degrees; wherein yet Reaſon and ſome little Experience hath ſhew'd me, *they* are not inſenſible. I found Signor *Caſſini*'s Obſervations, which I took from *Ricciolus* his *Aſtronomia reformata*, much more accurate than *Tycho*'s, and therefore ſought out Numbers that might anſwer them. The *Apogéum* I found it neceſſary to promote 44 minutes; ſo that *Anno ineunte* 1655. it might be in ♋ 7°. 30'. 0"; and to make the greateſt Equation only 1°. 54'. 13". whereby I found, the *Phænomena* would be anſwer'd much more accurately than I expected, and as near, all things conſider'd, as I could deſire.

But ſtill I was uncertain, whether the Refractions in the ſaid *Caſſini*'s Tables were juſt meaſures or not; and I had no conveniencies for making trial. At laſt, I thought on this Expedient, which fully ſatisfied me; *viz.*

I conſider'd, that if ſome of thoſe Obſervations of the Diſtances of ♀ from the ☉ by day, the Stars in the night preceeding or following, were skilfully examin'd; they might ſhew me the true Quantity of the Equations of the Suns Orb, or rather the Difference of his mean and equal Motion. I turn'd over his *Progymnaſmata*, and pitched on two. The *firſt* made *A.* 1585. the 5th. of *March*, hor. 4. 42'. and hor. 7. 12'. p.m; whereby I found, the ☉ at hor. 4. 42'. was 94. 47'. in antecedence of the *Lucida calcis* ♊. The *ſecond* made *A.* 1585. the 15th. *Septemb.* hor. 5. 15'. and hor. 6. 55. *mané*. Where-from (applying and conſidering the Refractions in both,) I found the Sun at hor. 6. 55'. to be 74°. 30'. in conſequence of the lower Head of ♊. The difference of Longitude betwixt theſe two Stars is 17°. 59': And therefore now the Sun in conſequence of the *Lucida calcis* ♊ 92°. 29'. So that the Suns *Apparent* motion betwixt the year 1582. the 5th. of *March* at hor. 4. 42'. and the year 1585. the 15th. of *Septemb.* at hor. 6. 55'. *mané* (beſides the whole revolutions) was 187°. 16: But the *Mean* motion is 191°. 2'; greater than the *Apparent* by 3°. 46': Which, parted in proportion to the Equation of the Earth's motion, collected for thoſe times from my New Tables, gives the greateſt Equation of the Orb, 1°. 54'. 15"; conſenting, to my wonder, (without any wreſting of the Obſervations) with that, which I deduced from *Caſſini*'s correct Meridional Altitudes.

I had not had time to examine any of thoſe others, he hath related; nor indeed are they any ways convenient: But by this what I have done you may ſee, that if once we get Inſtruments to our purpoſe, that then it will not be difficult to correct the *Suns motions* without the conſideration of the Meridional Altitudes, in which 24 ſeconds error gives the place above one minute amiſs.

At preſent I uſe Tables, for the Suns motion, grounded on this Equation, which is leſs than *Tycho*'s by no leſs than 9 minutes: Which muſt needs cauſe great alterations in our Numbers for all the other Planets; in correcting of which, I ſhall employ ſome of thoſe minutes I can ſpare from my more neceſſary ſtudies; and have hopes of good ſucceſs.

Tycho's great Equation made him commit no ſmall Errors, and put him upon ſtrange ſhifts to hide and ſalve them. All his Obſervations of the Planets in their Oppoſitions to the Sun, are to be corrected, before we may attempt to repreſent them by Numbers: For, his Errors in the Suns place made him err ſometimes 5 or 6 hours in the time of the Oppoſition: which muſt be reformed.

And that I may perform my Diſcourſe of the Parallax of *Mars* obſerv'd, I ſhall fall upon it at my ſpare hours after *Chriſtmas.*

Some Obſervations and Experiments made, and in a Letter communicated to the Publiſher, for the R. Society, *by the Learned and Inquiſitive Mr.* Martin Liſter.

I Shall venture to entertain you at preſent with a few looſe Notes, which you will be pleas'd to take in good part, and diſpoſe of them as you think fitting.

I. *Of the Effloreſcence of certain Mineral Glebes.*

I keep by me certain big pieces of crude Allom-Mines, ſuch as it was taken out of the Rock. I had alſo in the ſame Cabinet like pieces of the ordinary Fire-ſtone or Marcaſite of the Coal-pits, which here we call *Braſs-lumps*. In proceſs of time both theſe Glebes ſhot forth Tufts of long and ſlender fibres or threads; ſome of them half an inch long, bended and curled like hairs. In both theſe Glebes, theſe Tufts were in ſome meaſure tranſparent and cryſtalline. Theſe Tufts did as often repullulate, as they were ſtruck and wiped clean off.

Herein theſe fibres differ'd in taſt; the Alluminous very Allomy and pleaſantly pungent; the Vitriolick ſteptique and odious: Again, the Allom-ones, being diſſolv'd in fair water, raiſed a ſmall ebullition; whereas the Vitriolick fibres diſſolved quietly. The Allom-fibres were generally ſmaller, and more opaque, ſnow-like; the Vitriolick larger, many fibres equalling an horſe-hair in thickneſs, and more cryſtalline.

The water, wherein the Allom-fibres were diſſolv'd, did give no red Tincture with Gall; not by all the means I could deviſe to aſſiſt them; whatever hath (and that with great confidence) been ſaid to the contrary, by ſome of the Writers of our *Yorkſhire* Spaws: The Vitriolick did immediately give a purple tincture with Gall.

Having laid pieces of the ſame Marcaſite in a Cellar, they were in a few moneths cover'd over with *green Copperas*, which was theſe Fibres ſhot and *again diſſolved* by the moiſt Air, clodder'd and run together.

Expoſing other pieces of the ſame Vitriolick Glebe in my window, where the Sun came, they were cover'd over with a white farinaceous matter, that is, with theſe Fibres calcined by the rays of the Sun and warm Air, beating upon them.

Of what *figure* theſe Fibres were, whether round or angular, I could not well diſcern. But I take theſe fibrous and thread-like ſhootings of Allom and Vitriol to be moſt genuine and natural; and their Angular ſhootings, after ſolution, into Cubes and Rhomboides, to be forc't and accidental; Salts of very different natures, as well Vegetable as Foſſile, by a like proceſs in cryſtallizing of them, being obſerv'd to ſhoot into like figures. But this is not my purpoſe at this time.

II. *Of an odd figured* IRIS. See Fig. 3. and 4.

I have not obſerv'd any Rock or ſort of ſtone, whether Metalline or more Vulgar, which hath not its different ſort of *Sparr*, ſhot in ſome part or other of its bed or ſeams. And theſe Sparrs differ not only in their Colours and other accidents, but eminently too in their

Figure. To paſs by divers, which I have collected, I ſhall deſcribe one of a very curious Figure, and which (though very common in our blew-Lime-ſtone Rocks, out of which plenty of Lead-Ore is got,) yet is not, that I know of, mention'd by any Author.

Theſe Cryſtals are moſtly of a black water, like the black flint in Chawk-hills; but there are of them, which have a purpliſh or amethyſtine colour; and ſome there are as clear as cryſtal. They adhere to the ſeams of the rock, be it betwixt bed and bed, or where-ever there are croſs and oblique veins through the very ſubſtance of the bed.

The ſmaller the veins, the leſs the *Iris*. You will find of them as ſmall as wheat-corns, and others an hundred times bigger. They ſhoot from both ſides the ſeam, and mutually receive one the other.

They are figured thus, *viz.* a column of ſix plains very unequal as to breadth; the end adhering to the rock is always rugged, as a thing broken off; the other end of the column conſiſts of three quinangular plains, very little rais'd in the middle: theſe plains too are very unequal. Let them hug one another, or be any ways ſtraightned and compreſſed in their ſhooting; yet the number of plains mention'd, both of the column and top, is moſt certain. The places, where infinite of them may be had, are *Rainsborough Scarr* upon the *Rible*; alſo in a Stone-quarry near *Eſhton Tarne* in *Craven*.

III. *Gloſſopetra tricuſpis non-ſerrata.* Fig. 1. and 2.

Mr. *Ray* in his Travels hath theſe words concerning the *Gloſſopetræ*, pag. 115. *Of the* Gloſſopetræ *(ſaith he) I have not yet heard, that there have been any found in* England; *which I do not a little wonder at, there being Sharks frequently taken upon our Coaſts.* I have had out of the Iſle of *Shepy* in the River of *Thames*, very Sharks teeth dug up there; which could not be ſaid to be petrifi'd; though, as to the colour, they were ſomewhat guilded with a Vitriolick tarniſh at our firſt receiving them; but they were white, and in a ſhort time came to their natural colour.

In the Stone-quarries in *Hinderskelf*-Park near *Malton*, I had this ſtone (the ſcheme whereof I ſend you; *fig.* 1.) the greateſt rarity of this kind I ever met with, and which I took out of the rock there my ſelf. It is a fair *Gloſſopetra* with 3 points, of a black liver-colour, & ſmooth; its edges are not ſerrate; its *baſis* is (like the true teeth) of a rugged ſubſtance; it is carved round, the *baſis* with imboſſed work: It hath certain eminent ridges or lines like rays drawn from the *baſis* to each point.

IV. *Of certain* Dactili Idæi, *or the true* Lapides Judaici, *for* kind *found with us in* England. *Fig.*5.

The Stones call'd *Dactili Idæi* and *Lapides Judaici*, are brought over to us from beyond Seas in divers ſhapes;and ſome of them are deſcribed in Authors. We have plenty of them for *kind* in theſe parts, as in the Stone-quarries at *Newton* near *Hemſley*, and at *Hellingley* by *Malton*. There is ſome variety in the figure of them here alſo;but the moſt common one in theſe rocks is after the faſhion of a *Date-ſtone*,round and long,about an inch,and ſometime longer. They are a little ſwelled in the middle, and narrower towards each end: They are channelled the length-way, and upon the ridges knotted or purled all over with ſmall knots,ſet in a quincunx-order. The inward ſubſtance is a white opaque Sparr, and breaks ſmooth like a flint;not at all hollow in the middle,as are the *Belemnites.*

V. *Of the Electrical power of Stones in relation to a Vegetable Roſin.*

It ſo hapned, that having occaſion in *July* to view certain Foſſils, which I had diſpos'd of into divers Drawers in a Cabinet made of *Barbados Cedar*, I obſerv'd many of the ſtones to be thick-cover'd over with a liquid Roſin like Venice Turpentine. Examining further, there was not a Drawer, wherein there was not ſome more ſome fewer ſtones thus drenched.

That this could be no miſtake, as from dropping, the bottoms of the Drawers are of Oak. Again,many ſtones,which were lapped up in papers,were yet wholly infected and cover'd with this Roſin. Beſides, after diligent ſearch there appear'd no manner of exudation in any part of the Cabinet.

Two things I thought very remarkable: 1. That of the many ſorts of Stones I therein had, divers eſcaped, but not any of the *Hæmatites*-kind; having therein *Manganes*, *Sciſtos*, *Botryades*, &c. which were all deeply concern'd. 2. That amongſt perhaps 500 pieces, of the *Aſtroites* here and there one or two in an appartment, and ſometimes more, were ſeiſed, and the reſt dry; as it fares with people in the time of the Plague in one and the ſame houſe. I further obſerved, that ſtones of a ſoft and open grain, as well as thoſe of a hard and poliſh't *ſuperficies*, were concern'd in a manner alike.

'Tis certain, that the whole body of the Turpentine of the Cedar-wood was carried forth into the Air, and floating therein was again condenſed into its own proper form upon theſe ſtones.

This makes it more than probable, that Odoriferous bodies emit and ſpend their very ſubſtance. Thus *Camphir* is ſaid, if not well ſecured, totally to fly away. Again, it is hence evident, that there is great difference betwixt the *Diſtillation* of Vegetable Juyces, and the *Emiſſion* of Effluviums or this *natural* Diſtillation; *that* really ſeparating and dividing the ſubſtance into different parts; but *this* carrying out the whole entirely and un-alter'd in its nature.

VI. *Of the Flower and Seed of Muſhroms.*

The general and received opinion of *Botaniſts* concerning *Muſhroms* is that, which *Caſpar Bauhinus* in his *Pinax* expreſſes in theſe few words, *viz. Fungi neq; plantæ, neq; radices, neq; flores, neq; ſemina ſunt; ſed nihil aliud quàm terræ, arborum, lignorum putridorum, aliarúmq; putrilaginum humiditates ſuperfluæ.* I am of the opinion, that they are Plants of their own kind, & have more than a chance-original. We will inſtance in that *ſpecies*, called *Fungus poroſus craſſus magnus* I. B. The texture of the Gills is like a paper prickt full of pin-holes. In *Auguſt* this is very frequent under hedges, and in the middle of the Moors in many places of this Country. It ſeems to me (and, no doubt, it will to any perſon that ſhall well examine it, that the Gills of this Muſhrom are the very flower and ſeed of this Plant. When it is ripe, the Gills here are eaſily ſeparable from the reſt of the head: Each ſeed is diſtinct from other, and hath its impreſſion in the head of the Muſhrom, juſt as the ſeeds of an Artichoak hath in the bottom of it. The bigger end of the ſeed is full and round; and they are diſpoſed in a ſpiral order juſt as thoſe of the Artichoak. The like we do think of all other Muſhroms, however differently figured.

And if it ſhall happen to him that ſhall ſow them, that theſe will not produce their kind, but be ſteril; it is no ſtrange thing amongſt Plants, there being whole genus's of Plants that come up, and flower, and ſeed, and yet their ſeed was never known to produce Plants of their kind, being naturally ſteril, and a volatil duſt, as all the *Orchides* or *Bee-flowers.*

We ſhall not here omit to tell you further concerning this Muſhrom, that, when freſh gather'd, it is of a buff-colour inſide outſide; and yet, cut through the middle, it will in a moment change from a pale-yellow to a deep purple or blew, and ſtain linnen accordingly. A drop of the juyce, leiſurely ſqueezed out, will change, holding it betwixt your eye and the light, through all the colours of the Rainbow, in the very time of its falling, and fix in a purple, as it doth in the ſpringing out of its veins.

VII. *Of the ſpeedy vitrifying of the whole body of Antimony by Cawk.*

The ſeveral vitrifications of *Antimony* are either opaque or tranſparent. To the firſt kind I ſhall add one, which is in it ſelf very curious, and hath theſe advantages above the reſt, that it is done with great eaſe and ſpeed; and by it I have performed ſome things upon Minerals and Mettals, which with crude Antimony alone I could not effect.

Take of Antimony one pound; flux it clear: Have an ounce or two of the Cawk-ſtone (by and by to be deſcribed) in a lump red-hot in readineſs. Put it into the Crucible to the Antimony; continue the flux a few minutes: Caſt it into a clean and not greaſed Mortar, decanting the melted liquor from the Cawk.

This Proceſs gives us above 15 ounces of *vitrum* of *Antimony*, like poliſh't Steel, and as bright as the moſt refined Quickſilver. The Cawk ſeems not to be diminiſh't in its weight, but rather increaſed; nor will be brought to incorporate with the Antimony, though flux't in a ſtrong blaſt.

This Cawk-ſtone is a very odd Mineral, and I always looked upon it to be much a kin to the white milky Mineral juyces, I formerly ſent you a *ſpecimen* of: And this Experiment is demonſtrative, that I was not miſtaken; for, the milky juyce of the Lead-Mines vitrifies the whole body of Antimony in like manner.

That this Vitrification is from the *proper* nature of Cawk, I little doubt; for, I could never light upon any one mineral ſubſtance, which had any ſuch effect upon Antimony; and I have tryed very many, as *Lapis Calaminaris*, Stone-Sulphur or *Sulphur vivum*, *Galactites*, *Sulphur Marcaſite*, *Allom-glebe*, divers *Sparrs*, &c.

Cawk is a ponderous white ſtone, found in the Lead-Mines; it will draw a white line like Chawk or the *Galactites*: And though it be ſo free, that it is more firm, and hath a ſmooth and ſhining grain, Sparr-like, yet not at all tranſparent. Of the Spirit, it yields by diſtillation, another time. I am,

York, Novemb. 20. 1674. Sir, Your, *&c.*

An Accompt of ſome Books.

I. *TRACTS, containing* 1. Suſpicions *about ſome* Hidden Qualities *of the* Air, *with an Appendix touching* Celeſtial Magnets, *and ſome other particulars.* 2. *Animadverſions upon Mr.* Hobbs's Problemata de Vacuo. 3. *A Diſcourſe of the* Cauſe *of Attraction by Suction: By the Honourable* ROBERT BOYLE *Eſq; Fellow of the* R. Society, London, 1674. *in* 8°.

IN the *firſt* of theſe Tracts, the Noble Author, paſſing by thoſe obvious Qualities of the Air, *Heat, Cold, Dryneſs* and *Moiſture*, and ſuch others, as are now alſo well enough known, I mean, *Gravity, Springyneſs, Refractiveneſs*, &c. enquires into, and delivers his Conjectures about, ſome yet *more Latent* ones. And the chief account, upon which the Air may be thought endow'd with *Hidden* qualities, he eſteems to be thoſe Exotick effluviums, that probably do proceed *partly* from beneath the Surface of the Earth, *partly* from the Celeſtial Bodies; not denying mean while, that the Air may, eſpecially at ſome times and in ſome places, derive multitudes of efficacious particles from its own operations, acting as a Fluid ſubſtance upon that vaſt number and variety of Bodies that are immediately expoſed to it. Now, theſe Conjectures, grounded upon *Subterraneal* and *Sidereal* Effluviums, are in this Tract confirmed by many conſiderable and hitherto un-heeded Obſervations; and they are ſuch, that, if they prove to be well-grounded, they may lead us, (as the Author alſo intimates,) to other Suſpicions of no mean conſequence; As 1. That they may make us conſider, whether divers Changes of Temperature and Conſtitution in the Air, not only as to *manifeſt*, but as to the more *latent* qualities, may not ſometimes in part, if not chiefly, be derived from the paucity, or plenty, and peculiar nature of one or both of thoſe ſorts of Effluviums? 2. That they may ſuggeſt to us, as a thing not altogether improbable, that ſome Bodies, we are converſant with, may have a diſpoſition and fitneſs to be wrought on by, or to be aſſociated with, ſome of thoſe Exotick effluvia, that are emitted by unknown bodies lodged under ground, or that proceed from this or that Celeſtial body. 3. That they may put us upon the Inveſtigation, Whether among the Bodies we are acquainted with here below, there may not be found ſome, that may be *Receptacles*, if not alſo *Attractives*, of the Sidereal and other Heterogeneous effluviums that rove up and down in the Air? All which ſuggeſtions are countenanced in this Piece with divers un-common Obſervations. And from the laſt of theſe three, occaſion is taken, in a peculiar Diſcourſe, to enquire, Whether, as 'tis thought no impoſſible thing, that *Nature* ſhould *make*, ſo it may not be an unpracticable or hopeleſs thing, that *Men* ſhould *find*, or *Art* ſhould *prepare*, uſeful *Magnets* of the Exotick effluviums of the Lower region of the Earth, or the Upper of the World?

To this firſt part are ſubjoyned 1. Some Obſervations of the *Growth of Metals*, tending to reſolve this Inquiry, *viz.* whether a portion of Matter, wherein as yet no Metal, or but ſuch or ſuch a quantity of it, can be found, this being expos'd to the Air, will after a time either afford ſome Mettal where none appear'd before, or a greater proportion of it than it had before. 2. Some New Experiments about the *Preſervation of Bodies in Vacuo Boyliano*, or with excluſion of the Air; tryed upon *Bread, Milk, Cream, Cheeſe, Roaſted meat, Blood, Violets,*

lets,July-flowers,Roſes,Strawberries,Blackberries,Beer. All which, except the *Milk*, *Cream,* and *Blood*, remained good and without any notable alteration after a conſiderable time: But the *Milk*,upon giving an acceſs to the Air,after 3 moneths time,was found,though well colored, yet turned partly into a kind of Whey, and partly into a kind of ſoft Curd : The *Cream*, at a years end, appear'd to be more thick and Butter-like at the top than other-where,and by a little ſhaking was ſoon reduced to Butter : And the *Blood*,though for one or two of the firſt days it ſeem'd to continue fluid and of a florid color, yet afterwards degenerated into a blackiſh one, without ſtink. Of the *Beer*, thus exhauſted and ſecured from the Air,it was remarkable,that after much *Thunder* it had contracted no ſowrneſs,though that of moſt of the Neighbourhood had. And that the *Fructus horarii*, eſpecially ſuch as are very tender and juicy, ſhould without any additament be preſerv'd from putrefaction a great time longer than otherwiſe they would have been,is an Experiment that may give hopes,that both odd and uſeful things of this kind may be this way performed.

The *ſecond* Tract of this Book, being written *Dialogue*-wiſe,examines Mr.*Hobbs*'s Arguments for the *abſolute Plenitude* of the World, and ſhews them to be far ſhort of cogency. Here the Author, ſtill forbearing to declare himſelf either way in this Controverſie, does not tye himſelf ſtrictly to the Principles and Notions of the *Vacuiſts*, nor,though but for a while,oppoſes himſelf to thoſe of the *Pleniſts*; but conſiders,either upon the Doctrine of the *Vacuiſts*,or upon other grounds, Whether Mr. *Hobbs* have cogently proved his, and the Schools, Aſſertion, *Non dari Vacuum ?* And whether he have rightly explain'd ſome *Phænomena* of Nature, which he undertakes to give an account of, and eſpecially ſome in the Authors Engine, whereof he takes upon him to render the genuine Cauſes?Where occur divers excellent new Experiments, countenancing the Authors purpoſe againſt that of his Antagoniſt.

The *third* examines the Cauſe of *Suction*, and having rejected *Fuga Vacui* to be the Cauſe of the raiſing of liquors in Suction, and declared alſo, that he cannot acquieſce in their Theory,who refer it to the Action of the Suckers *thorax*; he ſhews,that the Aſcenſion of Water upon Suction may be cauſed otherwiſe than by the Condenſation or the propagated Pulſion of Air contiguous to the Suckers cheſt ; and likewiſe, that there may be caſes, wherein the Cauſe,aſſign'd in that *hypotheſis*,will not have place. Which done,he propoſes and makes out by Experiments his thoughts concerning that

Cauſe;which thoughts amount to this;That Liquors are upon *Suction* raiſed into pipes or other hollow Bodies,when and ſo far as there is a leſs preſſure on the Surface of the liquor in the Cavity, than on the Surface of the External liquor that ſurrounds the hollow body; whether that Preſſure on thoſe parts of the external liquor, that are from time to time impelled up into the orifice of the Pipe, proceed from the weight of the Atmoſphere,or the propagated compreſſion or impulſe of ſome parts of the Air,or the Spring of the Air,or ſome other Cauſe, as the preſſure of ſome other body quite diſtinct from Air.

II. *R.P.* Claudii Franc. Milliet de Chales *è S.J. CURSUS ſeu MUNDUS MATHEMATICUS,univerſam Matheſin tribus Tomis complectens.* Lugduni, 1674. *in fol.*

THE Author of this great Work declares in his *Preface*, that, having conſidered with himſelf the ſeveral things,that render to young Students of the Mathematicks the Study of thoſe Sciences difficult and perplexed, he hath endeavour'd ſo to compoſe and frame this his *Curſus Mathematicus*,as that every one,having but ordinary good parts, ſhall be able, by the attent peruſal of the ſame, without any other Maſter or Guide, to penetrate into the inmoſt depths thereof.

The *firſt* Tome comprehends Eight Books of *Euclid*; Arithmetick; *Theodoſius* his Sphericks;Trigonometry;Practical Geometry;Mechanicks; Staticks;Univerſal Geography; a Treatiſe of the Magnet; Architecture, and Carpentry.

Concerning *Euclid*, he diſſwades from teaching Novices *all* the Books of *Euclid* indifferently; alledging to have by experience found, that, at the beginning, time is ill ſpent in learning his 7th, 8th, 9th and 10th Books; and therefore would have his *Tyro* content himſelf with the knowledge of *Euclid*'s firſt 6 Books, and the 11th, and part of the 12th,(which Books he ſaith he hath rendred eaſie,)foraſmuch as all the principal parts of the Mathematicks may be demonſtrated without the other Books of that Author.

Touching *Arithmetick*,he delivers the Rules of it both in Integers and Fractions, together with the Extraction of the Square and Cubick Roots; annexing thereunto Arithmetick with Counters, and by Divination.

And becauſe the Principal Bodies,that are of a Mathematical Conſideration, are Spherical, he inſerts here the Elements of *Sphericks*, as by which the chief proprieties of the Celeſtial Orbs are demonſtrated: And thoſe Elements he takes from the famous *Theodoſius* who lived in the time of *Pompey* the Great.

His *Trigonometry* he divides into 6 parts: The 1st delivers the Canon of Sines, Tangents and Secants; the 2d explains the nature of Logarithms; the 3d and 4th teach to reſolve Rectilinear and Spherical Triangles; the 5th and 6th conſider Rectangular and Obliquangular Spherical Triangles.

His *Practical Geometry* conſiſts of 4 parts: The 1st treats of the Menſuration of Lines, both ſtraight and curve, acceſſible and inacceſſible; the 2d and 3d, of the Meaſure of Surfaces; the 4th, of that of Solids.

His *Mechanicks* contain 6 Books: In the 1st, he eſtabliſhes and explains the moſt Univerſal Principle of Motion; in the 2d, he applies that Principle to the *Vectis*, as in the 3d he does it to the *Axis in peritrochio*: In the 4th, he demonſtrates the power of the *Trochlea*; in the 5th, of the *Cochlea*; in the 6th, of the *Cuneus*, where he takes occaſion to diſcourſe of *Percuſſion*.

His *Staticks* are comprehended in 7 Books; whereof the 1st eſtabliſhes the Equipoiſe of the Elements, and explodes the Fear of a *Vacuum*; the 2d treats of the accelerated Motion of Heavy bodies; the 3d, of Inclined Plans, and Pendulums; the 4th, of the doctrine of Equiponderant bodies; the 5th, 6th, and 7th, of the Center of Gravity, of Superficies's, and Solids.

In his *Geography*, he conſiders the Figure of the Earth, aſſigns it its place, inveſtigates its Circumference and other dimenſions; diſtinguiſhes the number of the Zones, and the ſeveral Climats; enquires into the Heighth of Hills and the Depth of Mines; and adds divers particulars relating to the Ocean, Rivers, Fountains, and Lakes.

In his Treatiſe of *Magnetiſm*, he *firſt* ſets down the various Experiments made of the Attractive, Directive, and Communicative power of the Loadſtone; and as he infers thence ſeveral Concluſions, ſo he deduces ſeveral Practices from it. He intimates, amongſt very many other particulars, that, if the Authority of the H. Scriptures did not hinder, the conſideration of the Vertue of the Magnet would add much of probability to the *Copernican* Syſtem.

Proceeding to his *Architecture civil*, he diſcourſes of the known *Five Orders*, and annexes to it a Treatiſe of ordinary *Carpentry*.

In the *ſecond* Tome are contained theſe Treatiſes, *viz.* of the Section of Stones, of Architecture Military, of Hydroſtaticks, Fountains and Rivers, Hydraulicks, Navigation, Opticks, Perſpective, Catoptricks, and Dioptricks.

The Treatiſe of the *Section of Stones* is divided into 4 Books, whereof the firſt treats *de Compluviatis ſeu Cylindricis Fornicibus*; the ſecond, *de Conicis*; the third, *de præcipuis ſeu decumanis Teſtudinibus*; the fourth, *de Helicoidibus.*

His *Architecture Military* is compriſed in 7 Books; of which the firſt lays down the Grounds and Axioms of that Art; the ſecond is converſant about Regular Polygons; the third, about Outworks; the fourth, about Irregular Figures; the fifth, about Circumvallations, Trenches, *&c.* the ſixth, about Defence; the ſeventh, about Perſpective Military.

In the *Hydroſtaticks*, he conſiders 1. the Poiſe of Bodies ſwimming; how much Bodies loſe of their weight, being immers'd in water; how Mettals may be tryed in water, and the like.

In the Treatiſe of *Fountains* and *Rivers*, he diſcourſes of the Equipoiſe of Waters; of the ways of conveying Springs and Rivers; of Salient waters; of the ſeveral depths, which a River acquires by the inlet of ſeveral Torrents or other Waters, *&c.*

In that of *Hydraulicks*, he treats of all ſorts of Artificial Fountains, that perform their effect either by Attraction, or Compreſſion, or Expulſion; as alſo of all ſorts of Engins for raiſing of Water: Where he gives a particular account of the great Water-wheel at *Bremen*, which in every revolution ſends 25 Cart-loads of Water into that City. To all which he annexes the conſideration of all ſorts of Mills, principally of Corn-Powder-Paper-and Iron-Mills.

Paſſing on to *Navigation*, he ſpeaks 1. of Ship-Carpentry; of the ſeveral ſorts of Ships; of Rowing, Sayling, Steering, Loading. 2. Of the Make and Uſe of the Sea-Compaſs, and the method of obſerving, and allowing for, the Declination of the Needle. 3. Of the nature of *Loxodromy*, or that Line which a Ship makes on the ſurface of the Terraqueous Globe by the *ductus* of the ſame Rumb of the Mariners Compaſs. 4. Of Sea-Maps, and divers practices to determine the Ships way. 5. Of the way of keeping the account of Time at Sea; where occurs a long Diſcourſe about the *Longitude*, that is, the Eaſterly or Weſterly diſtance of the Ship from the place where the Voyage began. 6. Of divers Nautical Practices; as, making of Journals, repreſenting the Proſpects of remarkable Coaſts, by making Draughts, Plots and Maps of them, with their Longitudes, Latitudes, Scales, *&c.* as alſo of finding the Time of the Tides, and of conjecturing tempeſtuous weather.

Proceeding to *Opticks*, he gives an exact deſcription of the Eye; enumerates the various deceptions of the Sight; ſhews the cauſe of being long and ſhort-ſighted; treats of ſtriate images, which, being lookt on from different places, do vary; and of deform pictures, which, being beheld from a determinate place, are reform'd: Adding hereunto the doctrine of the Propagation of Light.

Concerning his *Perſpective*, he 1. gives the Grounds thereof; 2. teaches Ichnography and Scenography; 3. exerciſes the Art of Perſpective upon Roofs and Vaulted places; 4. treats of Shadows; annexing thereunto a Delineating Parallelogram.

Touching his *Catoptricks*, he therein conſiders the Reflexions both of Plain, Convex, and Concave Glaſſes: As in his *Dioptricks*, having explain'd the nature of Refraction, he writes of Concave and Convex Spectacles, as alſo of Teleſcopes and Microſcopes: Subjoyning thereunto a Diſcourſe touching Refractions colour'd, and the colors of Rainbows, and Priſmes. So far the *ſecond* Tome.

The *third* Tome contains his Treatiſes about Muſick, Pyrotechny, Aſtrolabes, Dialling, Aſtronomy, Calendars, Aſtrology, Algebra, the Method of Indiviſibles, and Conique Sections.

In the Treatiſe of *Muſick* he conſiders the nature and properties of Sound, and the reaſon of Harmony; as alſo the 3 Syſtems of Muſick, *viz.* Diatonick, Chromatick, and Enharmonick.

In that of *Pyrotechny*, he teaches, 1. the way of making all ſorts of Artificial Fire-works, both Feſtival and Martial; 2. he treats of the Art of Gunnery, and Baliſticks.

In the doctrine of *Aſtrolabes* he writes of both the Globes, of the *Analemma*, the Univerſal, Horizontal, and other Aſtrolabes.

His *Dialling* Treatiſe delivers *firſt* the way of making Dials in any Plain; and *then* Reflex and Refracted ones.

His *Aſtronomy* contains 7 Books: 1. Gives the doctrine of the *Primum mobile*, and the ſeveral Syſtems. 2. Of the Sun. 3. Of the Moon. 4. Of the Cycles. 5. Of the three ſuperior Planets, Saturn, Jupiter and Mars. 6. Of the two leſſer Planets, Mercury and Venus. 7. Of Comets.

His *Calendar* conjoyns and compares the whole Civil Year with the Motions of the Sun and Moon: Annexing thereunto the Civil Years of various Nations; Queſtions about Eaſter; Conſiderations about the Golden Number, Epacts, Solar Cycle, Indictions, Biſſextils, the Julian Period, *&c.*

Touching *Aſtrology*, he ſtrikes that out of the number of Mathematical Diſciplines, and repreſents the great vanity thereof.

Of the three remaining Treatiſes, *viz.* his *Algebra*, Doctrine of *Indiviſibles* and *Conick Sections*, he ſaith, he hath reſerved them to the laſt, leſt young Students of the Mathematicks ſhould be deterred or too long detained by thoſe more knotty or more difficult Studies.

Thus I have given as ſhort a view as I could of the Contents of theſe 3 Volumes, conſiſting of 30 Treatiſes in above an 100 Books. Mean time, what the Author hath performed *beyond* others, and how much alſo he hath borrow'd *from* others without taking notice of his Benefactors, I muſt leave to the Intelligent and well-read Peruſers of this Work to Judge.

III. *The SPHERE of M.* MANILIUS *made an ENGLISH Poem, with Annotations, and an ASTRONOMICAL Appendix. By* Edward Sherburn *Eſquire.* London, 1675. *in fol.*

THE Learn'd and Intelligent Author of this Work, rightly conſidering the great importance of the mutual Helps, which the Knowledge of Antiquity and the Purſuit of New Diſcoveries of the Preſent Times may afford to one another, thought fit to imploy part of his ingenious Talent in rendring Engliſh this Ancient Poem; the famous Author whereof, deſirous to inculcate knowledge with delight, was pleaſed to exhibit to the Age wherein he lived, the Principles of Aſtronomy in a Poëtical Dreſs; wherein divers Particulars do occur, touching the Nature of the Heavens and the Celeſtial Bodies, that agree with the Aſſertions of ſome of the moſt Eminent Modern Aſtronomers, *viz.* the Fluidity of the Heavens, againſt the Ariſtotelean Solidity of the Orbs; *the* Poſition of the Fixed Stars, not in the ſame Concave Superficies of the Heavens equally diſtant from the Center of the Univerſe, but at Unequal diſtances in the Ethereal region, ſome higher, ſome lower, (whence the difference of their apparent Magnitudes and Splendor;) *the* Fiery Nature and Subſtance of the Fixed Stars, and in conſequence their being endow'd with native luſtre, and making ſo many Suns, conform to this Sun of ours; and *the Galaxie*'s being an Aggregate of numberleſs ſmall Stars.

Of the Parts of this Poem, their Diſtribution and Order, and of the Interpreters Endeavors in explicating the ſame both in his Learned Notes and conſiderable *Appendix*, we ſhall, from the Author, give the Reader this Accompt, *viz.* 1. *That* the Poem begins with a ſuccinct Indication of the Original and Progreſs of Arts and Sciences, more particularly of *Aſtronomy*; of which laſt, beſides what the *Engliſher* hath noted in his not-common marginal Illuſtrations, he hath added, for the ſatisfaction of the more Curious, a Compendious Hiſtory, continued down to the Age wherein *Manilius* lived; together with a very inſtructive Catalogue of the moſt Eminent Aſtronomers from the firſt Parent of all Arts, and Mankind it ſelf, to this Preſent time. 2. *That* it is continued on with a Deſcription of the Mundan Syſtem, and of the Celeſtial Signs and Conſtellations; the former of which our Interpreter hath explain'd according to the various *Hypotheſes* both Ancient and Modern; the latter he hath deſcribed by the Number of the Stars that compoſe them, their ſeveral Denominations in moſt of the Learn'd Languages, and as they are diſtinguiſhed into Profane and Sacred Figures, according to the different *Uranography* of the ancient *Ethnicks*, and ſome late *Chriſtian* Aſtronomers. 3. That the 3d. Part of this Poem contains a Deſcription of the Celeſtial Circles; for the better underſtanding of which, over and above what is explain'd in the Marginal Notes, our Author hath added a Coſmographical Aſtronomical Synopſis, for the moſt part according to *Merſennus*, and thereunto annexed the xii Propoſitions of *Theodoſius de Habitationibus* in Engliſh. And ſeeing that *Manilius* hath touched upon the Fiery Nature of the Fixed Stars; his Interpreter hath here made ſome further and more curious Enquiries touching their Subſtance, Light, Colour, Scintillation, Number, Figure, Magnitude, Place, and Diſtance from the Earth, or rather the Sun. In the next place, the Planets are enumerated; whoſe ſeveral Denominations, by which they were known and diſtinguiſh't by the Ancients, the Interpreter hath given in his Notes; further enlarging about the Nature and Subſtance of the *Sun*, his *maculæ* and *faculæ* (which are likewiſe repreſented in a particular Scheme,) ſomething alſo being ſaid of his Vertiginous Motion, Magnitude, and Diſtance; as alſo of the *Moon* and her Spots, adding thereunto the Selenographick Schemes of *Hevelius* and *Grimaldi* with their reſpective Nomenclatures; and withall exhibiting a brief Accompt of the Nature, Subſtance, Structure, Figure, Magnitude and Diſtance of the other Planets. And becauſe this Poem concludes with a Corollary of Fiery Meteors & Comets; our Author hath in part explain'd them alſo in his Notes, more fully diſcourſing, in the *Appendix*, of their Names, Kinds and ſeveral *Species*, their Matter, Place, and Efficient Cauſes; and adding in the cloſe a Chronological Hiſtorical Table of the moſt notable Comets, that have appeared ſince the Flood to this preſent: Having in the Illuſtration of the whole obſerv'd the Method preſcribed by the Emperour *Juſtinian*, that great Legiſlator, thus expreſs'd, *Inſtit.* L. 1. *Tit.* 1. by himſelf; *Ita omnia videntur tradi commodiſſimè, ſi primò levi ac ſimplici viâ, deinde diligentiori atq; exactiori Interpretatione ſingula tradantur.*

Nor hath our *Interpreter* omitted to inform his Reader touching *Manilius* his *Life, Country, Quality, Studies, Writings;* &c. in the doing of which, as well as in compoſing this whole Work, he hath given ſufficient proof of his more than ordinary Acquaintance both with Ancient and Modern Writings.

He adorns the whole, as with many other very fair *Schemes*, ſo with thoſe of the two *Hemiſpheres* of the *Stars*; the one ſerving for the *Northern* Conſtellations; the other for the *Southern*; wherein the Stars are expreſs'd according to their ſeveral *Magnitudes*, as appears in the *Scale* thereof, ſet down in the *Southern* Hemiſphere. And the *Conſtellations* are only *pricked* out, wherein (with *Gallucius*) the Middle way is taken, betwixt not placing them in any, or repreſenting them in too dark ſhadow'd Figures, as ſome have done.

IV. AVONA; *or a Tranſient View of the Benefit of making* RIVERS *of this Kingdom* NAVIGABLE; *communicated by Letter to a Friend at* London; *by* R. S. London, 1675. *in* 8°.

THIS Letter, it ſeems, was occaſion'd by obſerving the Scituation of the City of *Salisbury* upon the AVON, and the Conſequence of opening that River to the ſaid City. The Author ſhews the manifold benefits, which will redound to the rich and poor, by making our Rivers navigable, to promote the wealth, navigation, commerce, and ſtrength of this great Iſland; and to advance Ingenuous Arts and Uſeful Knowledge, Inventions, Accommodations, and Diſcoveries; and particularly repreſenting the advantages of Inland-Cities above our Ports on the ſhore, by navigable Rivers, by the health, fulneſs of flowry and wholeſom Air from the environing fields, paſtures and groves.

On the by, he pleads for the Savages, that our *Engliſh* Colonies would permit and invite them to be Chriſtians, as *Ligon* endeavour'd to perſwade.

V. *An Eſſay to facilitate the Education of Youth, by bringing down the Rudiments of* Grammar *to the ſenſe of* Seeing; *which ought to be improv'd by Syncriſis, fitted to Childrens capacities for the learning eſpecially of the Engliſh, Latin and Greek Tongues: In three parts; An Accidence, a Middle Grammar, and a Critical or Idiomatical Grammar. By Mr.* Lewis *of* Tottenham, *in* 8°. London.

GRammar is the Foundation to the other Liberal Arts; Languages the Keys to Knowledge, and the Expedient for all humane Commerce: And *Letters*, by judicious Antiquaries acknowledged the moſt wonderful and the moſt beneficial of all the Old Inventions. And now by the active *genius* of this preſent Age, Men and Children may in far leſs time learn many of the moſt conſiderable Languages, than by the uſual Pedantry they could lately be taught an imperfect ſmattering in Latin only.

Next to *Grammar*, in old accompt, and for ſtrongeſt influence, and for the higheſt advantages in all humane Societies, both in

Peace and War, *Eloquence* was eſteemed more than fundamental, more than a Key, to unlock, regulate and ſet in order the Cabinets of mens Hearts and Minds, to aſſwage bad Paſſion's, and to excite nobleſt Affection's.

And *Poeſie*, in ſeveral kinds, being the higheſt Efflorеſcence of Eloquence, is with a ſublime and accurate felicity guided and promoted in a late Engliſh Tract, entitul'd, ***Reflexions on*** Ariſtotle's ***Treatiſe of Poeſie, containing the neceſſary, rational, and univerſal Rules for Epick, Dramatick, and the other ſorts of Poetry; with Reflexions on the Works of the Ancient and Modern Poets, and their faults, noted by*** R. Rapin. Printed in ***London***, in 8°.

I take leave, on this occaſion, to mention here, for ***Oratory***, the two Tracts, that came abroad ***A.*** 1672. in 8°. ***viz.*** I. ***Reflexions upon the Eloquence of theſe Times***, 1. ***in general***; 2. ***of the Barr, and*** 3. ***of the Pulpit***: Pretending to be a Tranſlation out of French; but by the addreſſes, concluſion, and often in the Body of the Tract, it appears to be a Free Application to our Engliſh Eloquence. II. By the ſame hand, ***A Compariſon between the Eloquence of*** DEMOSTHENES ***and*** CICERO; which (doubtleſs) was, as is acknowledged, really tranſlated out of French. Thoſe Reflexions upon Eloquence, by a few Emendations at a ſecond review, may give much light to ***Oratory***.

Errata in *Numb.* 109.

Pag. 193. lin. 28. r. *Littleſhall*.

LONDON,

Printed for *J. Martyn*, Printer to the *Royal Society*, 1674.

PHILOSOPHICAL TRANSACTIONS.

February 22. $16\frac{74}{75}$.

The CONTENTS.

An Accompt of ſome Obſervations of the late Eclipſe of the Moon, made in London, Paris, *&c. An Anſwer of D.* Paulus Biornonius *given to ſome Philoſophical* Quære's *concerning* Iceland. *Divers Rural and Oeconomical Inquiries recommended to Obſervation and Tryal. An Extract of a Letter of Dr.* Wallis *to M.* Hevelius *concerning Diviſions by Diagonals. An Accompt of ſome Books*: I. *Some Phyſico-Theological Conſiderations about the* Poſſibility *of the RESURRECTION*, by *R. Boyle* Eſq. II. *Waare Oeffening der* Planten, *door* Abraham Munting, *M.D.* III. *The Prevention of Poverty*; *by* Rich. Haynes.

An Account of what hath been obſerved here in London *and* Derby, *by Mr.* Hook, *Mr.* Flamſtead, *and others, concerning the late* Eclipſe *of the* Moon, *of* Jan. 1. $167\frac{4}{5}$.

		Tabb. Flamſted. Exhibent
Initium veræ umbræ	5^{h}. 22'.	5^{h}. 32'. 58".
Immerſio	6. 19.	6. 32. 10.
Emerſio	7. 58.	8. 7. 50.
Finis veræ umbræ	8. 58.	9. 7. 2.

At *Derby* (which differs from *London* in Longitude 5. min.) Mr. *Flamſtead* obſerv'd the beginning of the entrance of the True Shadow h. 5. & 19'.

The *Penumbra* was ſeen in *London* to continue near half an hour before it wholly quitted the Body of the Moon.

There was alſo obſerv'd here, about the middle of the total obſcuration of the Moon, an Eclipſe of a notable Fixt Starr, ſo as that the preciſe time of its immerſion and emerſion was ſeen.

Not doubting but that Mr. *Hook* himſelf will ſhortly make publick in a more ample manner theſe Obſervations, and divers conſiderable particulars by him then taken notice of; we ſhall forbear to ſay any more of it in this place.

An Account of the Obſervations of the ſame Eclipſe as they were made at Paris; *communicated by the Learn'd* Bullialdus *in his Letter to the Publiſher, dated* Febr. 6. 1675. *ſt. n.*

Iſmael Bullialdus *vidit*,						In Obſervator. Reg. obſervarunt. Par l'horologue à Pendule,			Tabb. Philolaicæ exhibent.		
	g.	'	h.	'	"	h.	'	"	h.	'	"
Initium veræ umbræ, alta capella ———	52.	26.	5.	32.	29.	5.	32.	50.	5.	44.	27.
Immers. altâ cap. ———	62.	8.	6.	33.	3.	6.	35.	46.	6.	46.	24.
Æmers. cap. Polluc. ———	43.	46.	8.	9.	30.	8.	8.	0.	8.	24.	24.
Fin. veræ umbræ, alt. Syrio.	20.	47.	9.	10.	0.	9.	9.	40.	9.	26.	21.

Cælum anticipat Tabulas; in aliis locis Tabulæ anticipant cælum.

[This we may publiſh more particularly by our next, when we ſhall have received the Pariſian Accompt in print.]

An Accompt of D. Paulus Biornonius, *reſiding in* Iceland, *given to ſome Philoſophical Inquiries concerning that Country, formerly recommended to him from hence: The Narrative being in Latin, 'tis thus Engliſh't by the Publiſher.*

THE Captain of the Engliſh Ship being ready to ſet ſail, I cannot now anſwer your *Queries* ſo fully as I intended; but purpoſe to do it hereafter, when I ſhall write the Natural Hiſtory of this Iland. Mean time be pleaſed to accept of the ſhort notes following.

Our *Air* is very healthy all the year long. The Diſeaſes, which the Inhabitants are moſt ſubject to, are the Colick and Leproſy. We have no Phyſitians; only two or three Chirurgions, that furniſh us with ſome Plaiſters for the dreſſing of wounds. In our Air, Iron ruſts very ſoon.

The Changes of the *Weather* are uncertain, nor do they fall out according to the four Seaſons of the Year. Sometimes it ſnows as well as't hailes in the midſt of Summer; and the winds blow now and then moſt furiouſly at the ſame ſeaſon.

As to the *Froſt*, it penetrates at moſt four foot into the Earth. Spirit of Wine and Oyl is free from being frozen, much more Quickſilver. We preſerve our Fiſh from putrefaction by burying them in the Snow. Bodies frozen do ſwell, and are changed in taſte and colour. The figure of the Snow is various, and ſo is it's ſize. Haile is roundiſh; the greateſt is only of the bigneſs of Haile-ſhot, that we kill fowl with.

Of *Meteors* I have obſerved the *Ignis lambens*, the *Draco volans*, and frequently two *Mock-ſuns*, with three Rainbows paſſing through them and the True Sun. We have no ſtated winds.

The Depth of our *Sea* varieth, the greateſt about our Coaſt is four-ſcore fathoms. How much Salt our Sea-water yields, I know not. The generality of our people uſe no ſalt; thoſe that do, make uſe of what is imported. Our Sea-water in clear nights being ſtruck with Oares, ſhineth like fire burſting out of a furnace. The *Tydes* obſerve the motion of the Moon. The Sea ſwells about the Moons riſing and ſetting;and it falls when ſhe is Southerly and Northerly. The ordinary higheſt Tydes are not above ſixteen foot, except in Autumn, when 'tis very tempeſtous,and then they riſe ſometimes to twenty foot. About the Full and New Moon are the higheſt Spring-Tides and the loweſt Neap tides.

As for *Lakes* and *Springs*; of the former we have very many,and moſt of them on high Mountains, which are ſtored with Salmons. Of the latter we have innumerable, guſhing out of Rocks. We abound alſo with *Hot Springs*, of which ſome are ſo hot, that in a quarter of an hour they will ſufficiently boyl great pieces of Beef; which is thus order'd: They hang Kettles with cold water over them, in which they put the meat to be boyled; for fear of either burning or throwing up the meat by the fervent and vehement ebullition of the hot waters. Theſe waters do harden and petrify about the brims of the *Thermæ*.

Our higheſt Hills are not above a quarter of a German mile high; which how I have meaſur'd, I ſhall give an account of hereafter. There is a whole ridge of Mountains thorough all the Iland. Our people live only in the Valleys, and towards the Sea-ſhore. There are other ignivomous Mountains beſides *Hecla*; yet all cover'd with Snow.

The Declination of the *Load-ſtone* is here to the Nord-weſt;(but how much, he notes not.)

Our *Soyle* is Clayie for the moſt part; in ſome places,Sandy; no where Chalky. No tillage at all. We are ſerv'd by imported Commodities, of which the chief are, Barley, Wheat, Linnen, Iron.

Touching *Animals*, we have great number of divers Birds in Summer. In Winter, Ravens,Eagles,Wild-Ducks, Swans. Whither the Summer-birds fly, we know not. We are pretty well ſtored with Horſes, Oxen, Cows, Sheep, Doggs,and in ſome places with Hens. Foxes there are in the Mountains; and when the Groenland-Ice comes upon us,that brings with them thoſe terrible gueſts,that do us ſo much miſchief, I mean,a great many Bears. Our Oxen and Cows live in winter upon hay; but our Horſe and Sheep make a ſhift to live upon the graſs under the ſnow, and the Corallin-moſſe, call'd *Muſcus Marinus*.

We have no Minerals, that we know; only ſtore of Brimſtone, of which we ſend out every year two Ships lading.

I had almoſt forgot to acquaint you with a very remarkable Obſervation made in the Year 1642. on the 13*th* of *May*, which is, that then all the Sea, which beats upon our Promontories, was for two dayes ſo pellucid and ſhining, that ſhells and the leaſt ſtones could be ſeen at the bottom, where the Sea was forty fathoms deep; inſomuch that the ſaid objects ſeem'd to be no further then three foot diſtant from the ſides of our Fiſhermens boats, who, when they ſaw it, were ſo frighted at it, that they preſently came in, and noiſed this all over the Country. It began in the morning about 9 of the clock, and the whole witneſſed by divers very honeſt and credible men.

Divers Rural and Oeconomical Inquiries, recommended to Obſervation and Tryal.

1. WHether ſuch Trees, as are inoculated in *February*, are free from all Worms; both themſelves and their fruit: as is believed by many?

2. Whether it be true, that Cions taken off from young Trees, which never yet bloſſom'd, be not good to engraft, and do never come to bear?

3. Whether Cions of Fruit-trees grafted upon Forreſt-trees will proſper and bear? Some curious perſons having affirmed, that they have tried Cions of Apple-trees upon Elms, without ſucceſs; yet others aſſuring, that Quinces have been grafted upoon Willows, and Pears upon white Thorns, with very good ſucceſs. Where we take the liberty to ſuggeſt, that it would perhaps not be amiſs, to obſerve ſome affinity in this kind of grafting, as to graft Cheſtnut-Cions on Oaks: Some would have Cions of Apples tryed on Oaks, and of Walnuts on Aſh-trees, *&c.*

4. Whether any Trees will live, of which a part is unbarked round about? Some affirming, that the *Alder* will thrive, notwithſtanding its being thus unbarked.

5. Whether the often tranſplanting of Wild trees does really turn them into Garden-trees?

6. Whether it agrees with Experience what *Laurembergius* affirms, that Gilly-flowers tranſplanted twice a year, Spring and Harveſt, become the fuller and the more beauteous?

7. Whether Trees and Shrubs are to be tranſplanted from the Full to the New Moon, about *Michaelmas*; but Herbs and Flowers, in the increaſing Moon; and all, about Evening.

8. Whether a Tree may be made to bear the *firſt* year, by drawing a branch thorough a pot, the branch being firſt pricked with a knife ſo far as it is to ſtand in the pot, and then watering it for 7 or 8 days, to make the branch ſhoot roots; further, cutting the branch from the Tree in *March* next, and knocking the pot away from about it, and ſo putting the branch together with the Earth into another good ſoil?

9. Whether Trees may be ſecured from froſt, by digging them about in *March*, and powring water from time to time into that hollowneſs, and keeping it about the roots till the bloſſom-time be paſt; or by putting, in the Spring, a pot full of water upon the Tree, or under it, whereby the froſt will fall into that veſſel, and leave the Tree unhurt?

10. Whether Corn ground to flower in *January* and *February* will keep longer good, and free from muſtineſs, than at other times?

11. Whether flower, kneaded and baked as ſoon as it comes from the Mill, whilſt 'tis yet warm, yields blacker and worſer bread?

12. Whether flower, ground in *February* and *March*, the Moon being but 3 or 4 days old, will laſt many years good?

13. Whether Wheat and Rey, ſprinkled with cold water before it be carried to the Mill, and ground the next morning, yields whiter bread; though it dulls the ſtones?

14. Whether Barley or Peaſe, burnt in a pan till they grow almoſt hard, and then put in Wine, will make good Vineger in 2 or 3 days?

15. Whether the Seed of Garlick put into Vineger that is yet freſh, will reduce it in 3 or 4 days into Wine again?

16. Whether the boyling of Vineger, and that in an earthen Veſſel, will always keep it good, and preſerve it from corruption?

17. Whether Bier may be kept from ſowring in Summer, by hanging into the veſſel a bagg containing a new laid egg (prickt with a pin full of little holes,) and ſome Lawrel-berries and a few barley-grains, put together: Or by hanging into the veſſel only a new laid Egg and ſome leaves of a Walnut-tree? And whether Lawrel-berries alone, their skin being peeled off, will keep Bier from deadneſs? And whether ſtale Bier will be made new and freſh again, by grinding ſmall the aſhes of Beech or Birch-trees, and taking as many handfuls of them, as you have ſuch Bier-veſſels, and thickning them with ſome of ſuch Bier to the conſiſtence of pulſe, and ſo powring it together into thoſe veſſels, ſtirring them well, and then letting it ſettle?

18. Whether Bier taſting of the cask may be freed of that taſte by putting ſome grains of wheat in a bagg, and hanging it in the veſſel?

19. Whether Rain-water, that falls with Thunder and Lightning, do more fertilize the ground, than other Rain-water ?

20. Whether the aſhes of Soap-boylers, carried on meddows, and they dunged therewith, eat away all moſſineſs, and make grow fine young graſs ?

21. Whether the Corn-worms (of which *Virgil* ſaith, *populátq; ingentem farris acervum* GURGULIO,) will be effectually driven away by a ſtrong decoction of Wormwood, and by boyling the ſame Wormwood in Herring-pickle, and then ſprinkling with this water the floor where the Corn lyes, and with a little of it the Corn it ſelf, ſtirring it well afterwards ?

22. Whether hands rubbed with Rue, will thereby be ſecured from the biting of Vipers, Scorpions, *&c.* ?

23. Whether putting a little Wormwood-water into your Ink, will preſerve the paper, you write on, from the gnawing of Moths and Mice ?

24. Whether hanging up the skin of a Paradiſe-bird in a ſhop, or putting it among cloath, will ſecure them from Moths ?

25. Whether Rue hung round about the place, where Poultry rooſts, will keep Weaſels and Cats from hurting them ?

26. Whether Ants or Piſmires will be driven away by ſcattering the powder of Brimſtone and *Origanum* or wild Marjoram ? And whether the ſame effect will follow upon the ſmoaking of *ſtorax* or *aſſa fœtida*; or upon the ſmoak of ſome of thoſe creatures themſelves burnt ?

27. Whether Locuſts, Flyes and Gnats will be driven away from Plants by ſmoaking of Wormwood, or by ſprinkling plants with a decoction of that herb ?

28. Whether Experience do verifie what *Conſtantin*, the Georgical Writer, ſaith of a way of freeing the ground from *Moles,* viz. by digging a deep hole, and putting into it a pretty deep glazed earthen pot, broad below and narrow a top, throwing a dead Crabfiſh into it ; whereupon the Mole, upon the ſmell of the ſtinking fiſh, will creep unto it, and falling into the pot, cannot get out again ?

Theſe, and the like Queries, (which hereafter may follow,) are raiſed from the Communications of ſeveral of our Correſpondents ; which we are unwilling to deliver poſitively, till we hear them aſſerted and confirmed by obſerving perſons upon their own practice and experience.

An Extract of a Letter of Dr. *J. Wallis*, to M. *Hevelius*, from *Oxford*, Decemb. 31. 1673. gratulatory for his *Organographia*; and particularly concerning *Diviſions by Diagonals*, lately inſerted in Mr. *Hooks* Animadverſions on the firſt part of the *Machina Cœleſtis* of the Honourable *Joh. Hevelius*; but ſo faultily there printed, that it was thought fit, at the Authors deſire, in his Letter to the Publiſher, of *Januar.* 4. 167$\frac{3}{4}$. to be here done more correctedly.

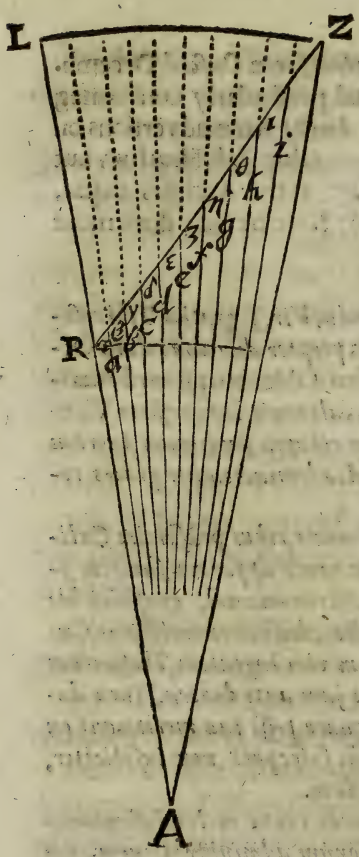
D*uplici ſaltem nomine, (Clariſſime Celeberrimèq; Vir,) gratias Tibi referendas habeo; meo ſcilicet, & totius Academiæ; propter duo dono data* Organographiæ *tuæ nuper editæ Exemplaria, Clariſſimi* Oldenburgii *curâ tradita. Quorum alterum, mihi deſtinatum, exoſculatus; alterum Inſigniſſimo* Vice-Cancellario *tradidi, in* Bodleianâ *Bibliothecâ (cum reliquis ſtudiorum tuorum monumentis) reponendum. Qui ſuo propterea atq; Academiæ nomine grates rependi voluit: Mihiq; vices ſuas hac in re permiſit.*

Sed & eſt cur, communi omnium Literatorum nomine, rebus præſertim Cœlicis addictorum, reddam gratias; tum ob immenſos in tanto apparatu ſumptus erogatos, tam pretioſam conquirendo Supellectilem Aſtronomicam, graphicè hic deſcriptam; tum ob indefeſſos labores, inſomnes noctes, diéſq; occupatiſſimos, Cœleſtibus acquirendis Obſervationibus impenſos; quarum vim ingentem, Theſaurum ſupra Aurum & Margaritas pretioſum, Erudito Orbi jam ante dederis, plura daturus indies. Verùm non eſt ut ſperem, me verbis æquare poſſe tua merita; qui ex privato penu ſumptus planè Regios erogâſti; onúſq; ſuſcepiſti non infeliciter, Herculeis humeris (ne Atlanteis dicam) formidandum.

Operis partem maximam jam evolvi; miratus inibi tantæ moles Inſtrumentorum ingenioſum regimen; & ſubtiliſſimam Diviſionum adminiſtrationem; cum pari diligentiâ conjunctam in Regulis & Dioptris ſolicitè curandis: Et quidem ſi hoc deeſſet, reliquus in caſſum cederet labor; quippe, exiguus & vix evitabilis in Regulis aut Dioptris error, totum Inſtrumentum vitiaret, omnéſq; inficeret Obſervationes.

Sed ſingulis immorari non licet. Unum tamen eſt quod attingam breviter; Nempe, Diviſiones per lineas Diagonales, circulos in Limbo concentricos interſecantes. Hanc Dividendi methodum, jamdiu receptam, ipſe retines; & quidem meritò; Circulóſq; hos concentricos, æqualibus intervallis disjunctos habes. Quod quamvis in exiguorum, aut etiam mediocrium, Inſtrumentorum Limbis latioribus, aliquid erroris poſſit inducere; in Tuis tamen tantæ amplitudinis Inſtrumentis, cum limbis exiguæ latitudinis, (quod & tu rectè mones,) nihil quicquam erit diſcriminis quod in ſenſus incurrere poſſit.

Hac tamen occaſione libet hic ſubjicere quod eâ de re jam olim (circa Annum 1650, *aut* 1651, *) meditatus ſum; atq; apud Adverſaria mea jam reperio. Nempe; ſiquis vellet minoris Inſtrumenti Limbum latiorem lineis Diagonalibus ſic dividere; quibus intervallis oporteat concentricos illos Circulos diſponere, ut Angulos invicem æquales deſignarent illæ circulorum cum tranſverſali interſectione; calculo Trigonometrico determinare.*



Diviſio Arcûs in Limbo Quadrantis (aliûſve ejuſmodi Inſtrumenti) per Circulos Concentricos, & Rectam Diagonalem.

Sit Latitudo Limbi (*RL*=) L. *Radius circuli intimi* (*AR*=) R; *extimi* (*AZ* = *AL*=) L+R=Z; *continentes Angulum* (*RAZ*=) A; *dividendum in partes quotlibet æquales* (*quarum numerus* n,) *Rectis* a, b, c, &c. (*quarum longitudo quæritur,*) *facientibus*, *ad RZ diagonalem*, *Angulos* α, β, γ, &c. *Adeóque* RAa=$\frac{1}{n}$A, RAb=$\frac{2}{n}$A, RAc=$\frac{3}{n}$A, &c. *Sitque ARZ*=O, & *AZR*=V.

Datis ergo Cruribus R, Z, *cum Angulo contento* A, (*adeòque reliquorum ſummâ* O+V, *inveniuntur reliqui*, (O *obtuſus*, V *acutus* :) *Nam*

$$Z+R\ .\ Z-R :: \textit{tang};\ \frac{O+V}{2}.\ \textit{tang};\ \frac{O-V}{2}.$$

Et $\frac{O+V}{2}+\frac{O-V}{2}=O.$

Deinde; *Cognitis Angulis* O, & $\frac{1}{n}$A, (*adeóque reliquo* α,) *cum interjecto Latere* R; *habetur Latus* a. *Nempe,*

$$\textit{Sin};\ \alpha.\quad R\quad ::\quad \textit{Sin};\ O.\quad a.$$

$$\textit{Et, pari modo, ex cognitis}\left\{\begin{matrix} O,\ \frac{2}{n}A, \\ O,\ \frac{3}{n}A, \\ O,\ \frac{4}{n}A, \\ \&c. \end{matrix}\right\}\textit{habentur}\left\{\begin{matrix} b. \\ c. \\ d. \\ \&c. \end{matrix}\right\}$$

Praxis.

Sit R=1. L=0, 2. Z=1, 2. A=10′. *Ergo* O + V=179°, 50′. *Et* $\frac{O+V}{2}$=89°, 55′. *Tum*

Ut Z+R=2, 2. *ad* Z−R=0, 2 ::

Sic tang; $\frac{O+V}{2}$ = 687,5488693. *ad* 62,5044427=*tang*; $\frac{O-V}{2}$. *cui reſpondet Angulus* 89°, 5′, 0″, 17‴, *proximè. Ergo* $\frac{O+V}{2}+\frac{O-V}{2}$=O=179°, 0′, 0″, 17‴, *fere. Cujus Sinus* 0,0174511: *nempe idem cum ſinu* 0°, 59′, 59″, 43‴.

Deinde; *ſecandus ſit Angulus* A, *in* 10 *partes*, *quorum quælibet* ı. *Quæruntur igitur*, a, b, c, d, e, f, g, h, i. *Nempe,*

			1,00000=R	
Sin; α (0°, 58′, 59″, 43‴,)	0,0171603.	R=1 : : *Sin*; O=0,0174511.	1,01694=a.	1694
Sin; β (0, 57, 59, 43,)	0,0168694.	R=1 : : *Sin*; O=0,0174511.	1,03448=b.	1754
Sin; γ (0, 56, 59, 43,)	0,0165780.	R=1 : : *Sin*; O=0,0174511.	1,05264=c.	1816
Sin; δ (0, 55, 59, 43,)	0,0162877.		1,07144=d.	1880
Sin; ε (0, 54, 59, 43,)	0,0159969.		1,09091=e.	1947
Sin; ζ (0, 53, 59, 43,)	0,0157060.		1,11110=f.	2019
Sin; η (0, 52, 59, 43,)	0,0154152.		1,13206=g.	2096
Sin; θ (0, 51, 59, 43,)	0,0151243.		1,15383=h.	2177
Sin; ι (0, 50, 59, 43,)	0,0148335.		1,17647=i.	2264
			1,20000=Z.	2353

Praxis

Praxis altera.

Sit R=1. L=0,1. Z=1,1. A=10′.*Ergo* O+V=179°,50′. $\frac{O+V}{2}$=89°.55′. *cujus Tangens* 687, 5488693. Et, *ut* 2,1. *ad* 0, 1 :: *ſic* 687, 5488693.*ad* 32,7404223½ =*tang*; *gr.* 88,15′,1″,57‴¼. =*tang*; $\frac{O-V}{2}$. *Ergo* $\frac{O+V}{2}+\frac{O-V}{2}$ =O=*gr*; 178, 10′,1″, 57‴¼. *Cujus Complementum ad Semicirculum*, *gr.* 1,49′, 58″, 2‴¾. *Cujus Sinus* 0,0319827. *Ergo*,

			1,00000=R.		
Sin;α(=1°,48′,58″,2‴¾)=	316920)	319827	(1,00918=a.	918	16
Sin;β(=1, 47, 58, 2¾)=	314013)	319827	(1,01852=b.	934	17
Sin;γ(=1, 46, 58, 2¾)=	311103)	319827	(1,02803=c.	951	19
Sin;δ(=1, 45, 58, 2¾)=	308198)	319827	(1,03773=d.	970	19
Sin;ε(=1, 44, 58, 2¾)=	305290)	319827	(1,04762=e.	989	18
	302343)		(1,05769=f.	1007	20
	299475)		(1,06796=g.	1027	20
	296567)		(1,07843=h.	1047	21
	293660)		(1,08911=i.	1068	21
	290752)		(1,10000=k.=z	1089	

Hactenus Adverſaria noſtra. Ubi duos caſus expendimus : Nempe, cùm Latitudo Limbi ponitur pars Quinta,& pars Decima,brevioris Radii ; & Angulus dividendus, 10 *minuta prima : Tantâ fere* ἀκρίβεια *quantam feret vulgaris Canon Trigonometricus. Et quidem ultima Unitas in ambiguo eſt; nunc juſto major, nunc juſto minor. Radium autem (ut ego ſoleo) facio* 1 ; *(non, ut plerumque fit,* 10000000;*) quò omnes Multiplicationes & Diviſiones per Radium faciendæ præcidantur. AdeóqueSinus habeo pro partibus Decimalibus; quibus itaque,cùm opus eſt,Ciphras præmitto,quò de Unius Integri loco conſtet.*

Simili proceſſu utendum erit,mutatis mutandis,ſi Latitudo Limbi ſumatur in aliâ quâvis proportione ad Radii longitudinem.

Sed commodius erit (ad vitandam moleſtiam toties quærendi partem proportionalem)ut ſumatur angulus O *commodæ magnitudinis (juſtis minutis primis determinandæ,abſq; annexis ſecundis tertiiſve;) atq; ita quæratur Radii maximi* Z *longitudo,eodem modo quo reliquorum* a,b,c,*&c.Putà,ſi,in Praxi poſteriore, ſumpto ut priùs* R=1,*& Angulo*,A=10′,*ſumatur Angulus* O, *(non qui illic prodit* 178°,10′,1″,57‴¼,*ſed potiùs)*178°,10′;*cujus complementum* 1°, 50′; *hujùſq; ſinus in ipſo Canone habetur* 0,0319922; *& reliquorum item*, α, β γ, δ, *&c. Sinus ſimiliter ibidem habebuntur; ut unâ tantum Diviſione opus ſit prò ſingulis exhibendis ; ipſáque Radii* Z *longitudo, non quidem præcisè ut priùs* 1, 1; *ſed huic proxima (quæ itaque ſumenda erit)* 1,09996. *Nempe,*

			1,00000,=R.		
Sin;α=1°,49′,=	317015)	319922	(1,00917,=a.	917	17
Sin;β=1,48,=	314108)	319922	(1,01851,=b.	934	18
Sin;γ=1,47,=	311200)	319922	(1,02803,=c.	952	17
&c.	308293)	319922	(1,03772,=d.	969	19
	305385		(1,04760,=e.	988	19
	302478		(1,05767,=f.	1007	20
	299570		(1,06794,=g.	1027	20
	296662		(1,07841,=h.	1047	20
	293755		(1,08908,=i.	1067	21
	290847		(1,09996,=k.=z	1088	

Similiter omnino res ſuccedet, ſi, ſumptis Radiis R,L, *cum Angulo* A, *quæramus* V, *& Radios intermedios; aut, ſumpto Radio* L, *cum Angulis* A,V, *quærantur* R, *& Radii intermedii.*

Verùm, ſi Limbi Latitudo ſit Radii nonniſi pars Trigeſima, Quadrageſima, aut adhuc minor; atque Angulus dividendus, non quidem 10 *minuta prima, ſed totidem ſecunda, ſeu minor adhuc: ſubtilior res eſt quàm ut vulgaris Canon Trigonometricus hic adhibeatur, & quæ omnem ſenſum fugit; ipsique Circuli concentrici diſtantiis æqualibus, quantum ſenſu poſſumus diſtinguere, invicem disjuncti: quippe unius Pollicis pars milleſima, nedum decies aut centies milleſima, minor eſt diſcrepantia quàm ut ſenſu percipi poſſit.*

Sed nimius ſum in re levi. Felicem itaque jam ineuntem Annum comprecatus, longâ ſequentium ſerie continuandum, Valere jubeo.

An Accompt of ſome Books.

I. *Some Phyſico-Theological Conſiderations about the* Poſſibility *of the* Reſurrection; *by the Honourable* Robert Boyle *Eſq; Fellow of the* R. Society. *London,* 167$\frac{4}{5}$. *in* 8°.

THE Noble Authors deſign in this Diſcourſe being to ſhew, that the *Philoſophical* Difficulties, urged againſt the *Poſſibility* of the RESURRECTION, are nothing ſo inſuperable, as they are by ſome pretended, and by others granted, to be; and having handled this Subject in ſuch a manner, as to make it appear, that *ſound Philoſophy* may furniſh us with good Weapons for the defence of our Faith, and that *Corpuſcularian* Principles may not only be admitted *without* Epicurean Errors, but be employed *againſt* them: For theſe reaſons, it was thought it would not be altogether beſides the purpoſe of theſe Tracts, to give ſome account of this valuable Eſſay: Wherein 'tis made out by good Philoſophical Obſervations and Experiments, 1. That a Humane Body is not ſo confined to a determinat bulk, but that the ſame Soul, being united to a portion of duly organized Matter, is acknowledged to conſtitute the ſame Man, notwithſtanding the vaſt Differences of bigneſs, which are at ſeveral times between the portions of Matter whereto the Humane Soul is united. 2. That a conſiderable part of the Humane Body conſiſts of Bones, which are bodies of a very determinate nature, and not apt to be deſtroyed by the operation of Earth or Fire. 3. That of the leſs ſtable, and eſpecially the fluid, parts of a Humane Body, there is a far greater expence made by Inſenſible Tranſpiration, than even Philoſophers would imagine. 4. That the ſmall particles of a reſolv'd Body may retain their own nature under various alterations and diſguiſes; of which 'tis poſſible they may be ſtript afterwards. 5. That without making a Humane Body ceaſe to be the ſame, it may be repaired and augmented by the adaptation of congruouſly diſpoſed Matter to that which pre-exiſted in it. Which things being ſo, conſidering Men do not ſee, why it ſhould be impoſſible, that a moſt Intelligent and an Almighty Being ſhould be able ſo to order and watch the particles of a Humane Body, as that *partly* of thoſe that remain in the Bones, and *partly* of thoſe that copiouſly fly away by inſenſible tranſpiration, and *partly* of thoſe that are otherwiſe diſpos'd of upon their reſolution, a competent number may be preſerv'd or retrieved; ſo that ſtripping them of their diſguiſes, or extricating them from other parts of Matter, to which they may happen to be joyned, he may reunite them betwixt themſelves, and, if need be, with particles of Matter fit to be contexed with them, and thereby reſtore or reproduce a Body, which, being united with the former Soul, may recompoſe the ſame Man, whoſe Soul and Body were formerly disjoyned by death.

Which being deduced at large in this Diſcourſe, it is concluded with the conſideration of *their* opinion, who, to facilitate the defence and explication of ſo abſtruſe a point, allow themſelves the latitude of expounding the Article of the *Reſurrection* in this manner; That, in regard the *Humane Soul* is the Form of Man; ſo that, whatever duly organiſed portion of Matter 'tis united to, it therewith conſtitutes the ſame Man; the import of the *Reſurrection* is fulfilled in this, that after death there ſhall be another State, wherein the Soul ſhall no longer perſevere in its ſeparat condition, but ſhall be again united, not to an Etherial or the like fluid matter, but to ſuch a ſubſtance, as may properly enough be called a Humane Body, *&c.*

II. *Waare Oeffening der PLANTEN, door* Abraham Munting, *M. D. and Prof. Botanices at* Groningen. *Printed at* Amſterd. 1672, *in* 4°.

IN this piece the Author makes it his buſineſs to deſcribe, from his own obſervation and ſearch, the Nature, Culture, Preſervation and Propagation of Trees, Shrubs, Herbs, and Flowers: Of *Trees* thus deſcribed, there are 65: Of *Shrubs*, 64: Of *Herbs*, and *Flowers*, 449. In all, 578. Of which there being many, that are Exotick to *Europe*, the art and way of ordering them in theſe parts, is, among the reſt, here deliver'd.

Speaking of the ſetting of Kernels and ſowing of Seeds, he gives this advertiſement, that the Kernels and Seeds of ſuch Trees and Plants as bear their fruit above ground, muſt be ſet or ſown in the *decreaſe* of the Moon; but of ſuch as bear their fruit under ground, as *Turnips*, *Parſnips*, *Carets*, &c. muſt be committed to the ground in the *increaſe* of the Moon: Of which, *he adds*, if the contrary be practiſed, it will be found, that thoſe Trees and Plants will indeed bear many branches and large leaves, but little, and that very ſmall, fruit. See the Author ch. 1.

To obtain extraordinary good, big, and beautiful Apple-fruit, he adviſeth by all means to graft good graffs upon ſuch Apple-ſtocks as are produced from the Seed,and have been deprived of their Heart-root, which is that which ſhoots directly downwards. *Ibid.*

Againſt *Caterpillars* and black *Flyes*,he preſcribes as an excellent remedy,to take Rue,Wormwood,and right Virginian Tobacco, of each a handful, and to boyle it together in two pails of water or ſomewhat leſs,in a Kettle,for half an hour, and having ſtrain'd it, to beſprinkle two or three times the Trees, when bloſſoming therewith. *Ibid.*

To keep whole *Quinces* ſound for a great while,he adviſes to gather them with the hand in the full Moon of *October* in dry weather, and being well rubb'd and freed from all their *Lanugo* or woolineſs, to put them in dry ſaw-duſt or ſand in a dry place, without letting them touch one another.

To this he ſubjoyns his way of keeping *Cherries* and other fruit all the year long.

Diſcourſing of the *Platanus*, or Plantain-tree, he mentions one of *Aſia* recorded in Hiſtory, fourſcore foot big in compaſs, wherein ſuch a cavity was made, that *Lucinius Mutianus*, Conſul of *Rome*, often dined with eighteen in company.

Deſcribing the *Rhamnus Catharticus recentiorum*, otherwiſe *Spina Infectoria*,he obſerves, that the fruit of it, before 'tis ripe,being dried a litle, and infuſed in common or Allum-water, yields a yellow colour; but being full ripe, a green.

Treating of the *Tilia* or the *Lime-tree*,he takes notice,that whereas anciently they uſed the inner-bark thereof,called *philyra*,to write upon,himſelf hath ſeen a whole book made of ſuch bark all written upon,which was above 1000 years old; and that *An.* 1662. one of ſuch books was bought by the Count of St. *Amour*, then Governor of *Arras*,for the Emperors uſe,at the rate of 8000 and odd Dutch Gilders, which had formerly been in the Library of Card. *Mazarin* at *Paris*,wherein was written that never yet publiſh'd piece of *Marcus Cicero de ordinanda Republica*, and *de Inveniendis Orationum Exordiis*; the which he ſaith is now kept amongſt the Cimelia of the Emperour at *Vienna*.

Deſcribing the nature and ordering of the *Cinnamon-tree*, of which one had been ſent to the Author, and came in a good condition to his hands; he relates, that thoſe in *Ceylon* are the beſt ſort of all,which bear a white and very fragrant flower, and an oval black fruit, and of which the ſecond bark yields the right Cinamon: To which he adds the great care he uſed in preſerving that, which was ſent him, by houſing it by times in a room furniſh't with a warm ſtove, and by keeping it there till *May*, and ſometimes powring on the top of it ſome milk and rain-water,mingled in equal quantity,or ſome Niter-water mingled with pigeon-dung,*&c.*

The *Nutmeg tree*,it ſeems,is of ſo tender a nature,that of 3 *ſtems*, that were ſent him, he could, in ſpight of all his care, keep alive no more but one,and that no longer than 2½ years.

Delivering the culture of that rare African-tree,*Guanabanus*, he teaches a general way to make all ſorts of hard exotic ſeeds thrive in theſe parts,*viz.* Take ſome freſh Horſe-dung,put it in a glaſs,and upon it your ſeed; powr thereon ſome Salpeter-water,that is,Rain-water,wherein ſome Salpeter hath layn a while infuſed, ſo as to cover the ſeed;then place it upon an Oven,continually,but moderately,kept warm,or in a hot Sand-furnace;and you will find it ſoon to ſwell,and beginning to burſt,take it out gently, and at the increaſe of the *May*-Moon,lay it in a pot filled with a common ſandy Earth mix't with horſe-dung of 2 years old, and hen-dung of one year old, and ſome mold of rotten trees; let this earth not be above 2 ſtraw breadths deep; and put this pot in a very warm place, to wit, in horſe-dung,for a forthnight,and then refreſh it by putting it in new warm horſe-dung until *June*, covering it in the night with glaſſes; and it will,*ſaith he*,thrive exceeding well.

Speaking of the *Glans Unguentaria*,otherwiſe call'd *Balanus Mirepſica* or *Ben Arabum*,a very rare Tree,yielding a moſt fragrant and highly eſteem'd oyl;he is very particular in deſcribing the extraordinary care he uſed in cultivating ſuch, as were ſent to him, in *Holland.*

In the 2d.Book,treating of *Shrubs*, he relates,that he hath kept,for ſome time,2 young *Clove-trees*(ſent him out of the Iſles of *Amboina*,) ſo as that one of them ſhot in one year 3 inches higher, than it was before; adding the manner of his ordering them. He alſo takes notice, that thoſe trees of this kind, which grow in *Java* or *Ceilon*, bear little or no fruit,and that they love much heat and rain,and do exceedingly draw to themſelves the moiſture of the ground encompaſſing them, ſo as that almoſt nothing near them will grow.

Deſcribing the Shrub,called *Agnus caſtus*,he notes,that as anciently the Athenian Ladies, keeping the Anniverſary of their Goddeſs *Venus*,filled their beds with the Leaves of this Plant,to obviate unchaſtity;ſo ſome of the Italian Monks this day not only fill the pillows, they lye on, with the leaves,bloſſoms and ſeed of the ſame, but alſo tye about their middle ſome of the branches thereof, to preſerve their chaſtity.

In his deſcription of ordering of *Roſe-trees*, he ſets down a way to have always big and beautiful Roſes;which is,by cutting them down to the ground every fifth year, and renewing the Earth with ſome old cow-dung, and by trimming them every Autumn in *October* a little before the full of the Moon. To this he ſubjoyns a way of long preſerving Roſes, *viz.* by gathering them dry and yet cloſed, filling a well-baked grey earthen pot to the top with them, ſprinkling over them ſome good French wine with a little ſalt in it, and ſo ſetting them by very well cloſed, in a dry cellar; and as you take them out, dry them in the Sun or at a fire, where they will open themſelves, and give a good ſcent.

Putting the *Indigo* amongſt Shrubs, he relates, how himſelf cultivated it, ſo as to keep it good for ſeveral years in *Holland*, where, he ſaith, it grew up to the height of above a foot and an half.

Examining the ſeveral ſorts of *Vines*, and among them the *Vitis Virginiana foliis laciniatis*, he not only teaches the culture of it, the art of obtaining better and bigger grapes then ordinary, and the ſeveral ways of long preſerving them, (one of which is, by putting them unbruiſed in a box, covering the bottom of it with courſe dry ſand an inch high, and then laying the cluſters upon that, and powring the like over them, and ſo on *ſtratum ſuper ſtratum*, and keeping the box in a dry place,) but alſo obſerves a peculiarity in the ſame, which is, that the roots of it do love moiſture ſo well, that they will deſcend ſometimes 12 or 13. foot deep (as he affirms to have found himſelf) to get into running water under ground.

Treating of *Capers*, he affirms to have found in a garden at the *Hague* one of theſe Plants ſet in the common ground, and there keeping good in a hard winter, only a little cover'd.

Deſcribing the ſeveral ſorts of *Cardamom*, their nature and culture, he ſaith, though the ſeed that was ſent him from the coaſt of *Malabar*, and from *Java*, would not with all his care thrive with him; yet that which came to him out of *Guiny*, did, by the great induſtry he uſed in the ordering thereof.

Out of the 3d. Book, about *Herbs*, we can here take notice but of very few; of which the firſt ſhall be the *Jalappa vera*, or the *Mirabilis Peruviana*, bearing a very pleaſant flower, which varies almoſt in all the individuals thereof, and opens not but about Sun-ſet, yielding all night a moſt fragrant ſcent, which is the ſtronger, the darker the night is, and the weaker, the clearer the night is; being quite deſtitute thereof in the day time, except it be cloſe and rainy weather; the heat of the Sun, it ſeems, conſuming the ſubtile odoriferous particles. The like quality is obſerv'd in one kind of *Geranium*, which therefore is called *Geranium nocte olens.*

Of *Onions* he obſerves, that they thrive beſt, when ſet at the time of the decreaſing Moon, and beſt of all, when the Moon is neareſt its end.

Of the *Aloë Americana mucronato folio*, he relates the ſtrange quickneſs of its growth, one of that plant in the garden of Card. *Farneſius* at *Rome* having ſhot up in one month to the heigth of 23 foot; and another at *Madrid* in one night 10 foot high, and after that, in 8. days, 25 foot; which was there held for ſo great a Miracle, that they built a Chappel upon the place, &c.

Of the *Sugar-Cane* he teaches the culture, and mentions to have had one of them, that with great care laſted good in his garden two years, and had young ſhoots, but dyed the third in Autumn.

Treating of the *Braſſica Cauli-flora*, or Colly-flowers, he takes occaſion to recommend a way of preſerving theſe and other ſuch plants, when young, from Caterpillars and the like Vermin, *viz.* by putting their dung in a glaſs, covering it with Saltpeter-water (above-mentioned) and expoſing it to the Sun, which will ſoon make them burſt and ſprout; whereupon they are to be put in a rich ground at a ſtraw's depth, well fenced from cold winds, and covered with ſtraw in a ſharp air, each ſeed by it ſelf, a hands breadth diſtant from one another; watering them in dry weather with rain-water mingled with ſheeps-dung, expoſed for a while to the Sun, and then powred off and mix'd with a little Salt-peter-water; which being carefully done will not only haſten the growth of theſe young plants, but alſo keep them from all ſuch Vermine.

Diſcourſing of the *Sedum majus arboreſcens*, he obſerves, that its upper, as well as lower, branches, ſhoot down into the ground, and there become new roots; and then he teaches, that all ſorts of plants, when they come up, may be ſecured from the annoiance of Birds, Mice, and other Vermin, by infuſing their ſeed for a while in the expreſſed Juyce of Houſe-leek; which, he ſaith, will alſo meliorate the fruit.

Speaking of *Peaſe*, he notes, that being planted in the wane of the Moon, they yield few leaves and ſtore of peaſe; but if at the time of the increaſe of the Moon the contrary; as alſo, that thoſe that have been attached by worms, do yield the beſt and ſweeteſt peaſe. If you will have Peaſe 2 or 3 weeks ſooner than others, plant them in an open, dry and ſunny ground in *Novemb.* after the laſt quarter of the Moon, before the froſt coms in, and do not cover them, that ſo they may ſhoot no, or little, root at the ſeaſon; and they will ſhoot and grow the following Spring, before others be ſet, eſpecially if they ſtand in long rows, a foot and a half diſtant from one another, for the Sun freely to play on them.

Treating of *Melons* and *Cucumbers*, he gives good directions for the Culture of the *former* in theſe parts, and for procuring greater or ſmaller fruit of the *latter*, as alſo for preſerving theſe all winter long.

Of the *Conſolida regalis*, he teaches a way of obtaining double ones from ſingle, *viz.* by keeping only the Heart or main-ſhoot or ſtem, and gathering the ſeed thereof, and doing the like the next year with the ſeed produced of the former, and then ſowing this ſecond ſeed the third year.

Deſcribing the *Juca glorioſa & Americana filamentoſæ*, and directing the manner of cultivating it, he affirms to have had one of them grow in his own garden, producing the firſt time three-hundred and ſixty four flowers upon one only ſtem at one and the ſame time altogether.

Conſidering the *Dipſacus ſpinoſus Americanus*, (the *Teaſel* of *America*) he notes this peculiar in it, that it ſhuts moſt of its leaves from beneath ſo cloſe, that the rain falling into them, cannot run out again, but is there ſtay'd, till by drought the leaves ſhrinking do open a little, whereby the rain-water ſinks downward, and moiſtening the root, refreſhes and recovers the whole plant.

Mentioning the *Ferrum equinum volubile* (by him eſteem'd the ſame with the *Contrayerva*,) he ſaith to have had ſome of the ſeed, come out of *America*, and ſent him from St. *Lucar*, which, having infus'd in Saltpeter-water and horſedung in a glaſs, and ſet upon a warm iron-oven, till it ſwelled and broke, he put it in a pot fill'd with good mould and ſtanding in a warm place; whereupon it ſoon began to appear above ground, and ſhot that year to the height of 3 foot, the next year yet higher, and then produced alſo 2 or 3 flowers, which, without leaving any ſeed, periſhed.

Concerning the *Linum Sativum* (*manured flax*,) he takes notice that it draws to it ſelf all the neighbouring goodneſs of the ground, and makes it very barren for other things; and then, that the *cloſer* the ſeed of it is ſown, the *finer* flax it yields.

If we had not been obliged to be ſhort, we ſhould have glanced at many other plants, whoſe culture & peculiarities this Auth. deſcribes, & eſpecially at divers of ſuch, as are originally *Indian*, *Arabian*, and *African*; the method of the ordering of which he hath taken pains to deliver with care. I ſhall only in ſhort annex a few lines concerning the ſtrange and extravagant Trade, that was driven with *Tulips*, A. 1634. 1635. 1636. and 1637. in *Holland*; when, witneſs this Writer, many Shop-keepers and Tradeſ-men quit their Shops and Trades, and wholly addicted themſelves to the ſole Trade of *Tulips*, which were then valued above gold, pearls, and the moſt precious gems; inſomuch that for one Tulip, call'd the *Vice-roy*, were bought theſe following commodities, *viz.* 2 laſts of Wheat, 4 laſts of Rey, 4 fat Oxen, 12 fat Mutton, 8 fat Hogs, 2 Hogſheads of Wine, 4 tuns of good Bier, 2 tuns of Butter, 1000 lb. of Cheeſe, a Bed with all its appurtenances, a ſuit of Cloaths, and a ſilver Beaker; valued in all 2500 gilders, or about 200*l*. ſterl. Moreover, there were offred 12 acres of land, lying in a good place, for one *Tulip-bulbe*. And in a publick outcry of ſuch bulbes there was made of them the ſum of 90000 gilders. And they ſold many of them by weight and their names, at an incredible rate; which when it was come to be intolerable, the States, weighing the miſchiefs thereof to ſubſtantial trade, and conſequently to the public, decried it, and ſo brought it down, that a Tulip, which had coſted 5000 gilders, was a little while after bought for 50 gilders, *&c.*

III. *The Prevention of Poverty; ſhewing the Cauſes of the decay of Trade, Fall of Lands, and Want of Money: With Expedients for remedying the ſame, and bringing the Kingdom to an eminent degree of Riches and Proſperity. By* Rich. Haynes, *London*, 1674. in 8°.

THE promiſing Title invited me to look into this ſhort Tract: Wherein I find a part of the ſame, that is repreſented by ſeveral Authors in the foregoing *Tranſactions*, n°. 101. 102. 103. But with offer of Solutions and Anſwers againſt the ſtrongeſt Objections deviſed againſt his particulars, which are theſe: 1. To advance our *Staple-Trade*, by reſtraining effectually, by penalties or otherwiſe, the exportation of unwrought Wool, and Fullers Earth, which is neceſſary for cloathing, and can be had no where but in *England*. 2. To promote the *Linnen Trade*, and the ſowing of Hemp and Flax, for domeſtic uſes, and for our Naval affairs. 3. He ſaith, *Salt* may be made at home, enough for all our occaſions, and as good for all purpoſes as the Bay-Salt imported. 4. *Salt-peter*, of which he ſaith we may make and raiſe a ſufficient quantity in our own Nation, for all occaſions. 5. To promote *Iron-works*: In this he diſſents from our former Adviſers, who conceive them to be deſtructive to our Timber, neceſſary for Shipping: But he offers reaſons to the contrary; that it will raiſe the price of wood and coal, and encourage the planting of Coppices and Timber-woods on many bare and barren hills, *&c.* Others wiſh, that more *Iron-mills* were employ'd to reduce that Wilderneſs of *New-England* to more profitable Tillage; and more curious *Iron-works* deviſed for many vacant hands in our *England*.

What he ſaith of altering *Coine*, and other ſuch matters, I muſt refer to more competent Judges in ſuch caſes, *&c.*

London, Printed for *John Martyn*, Printer to the Royal Soci

Fig. 1:

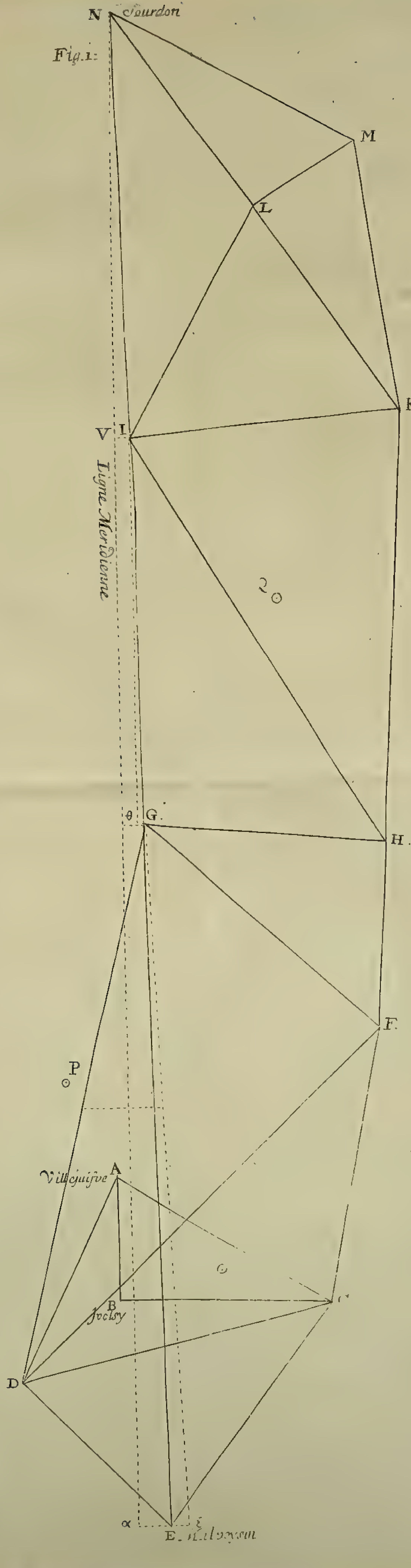
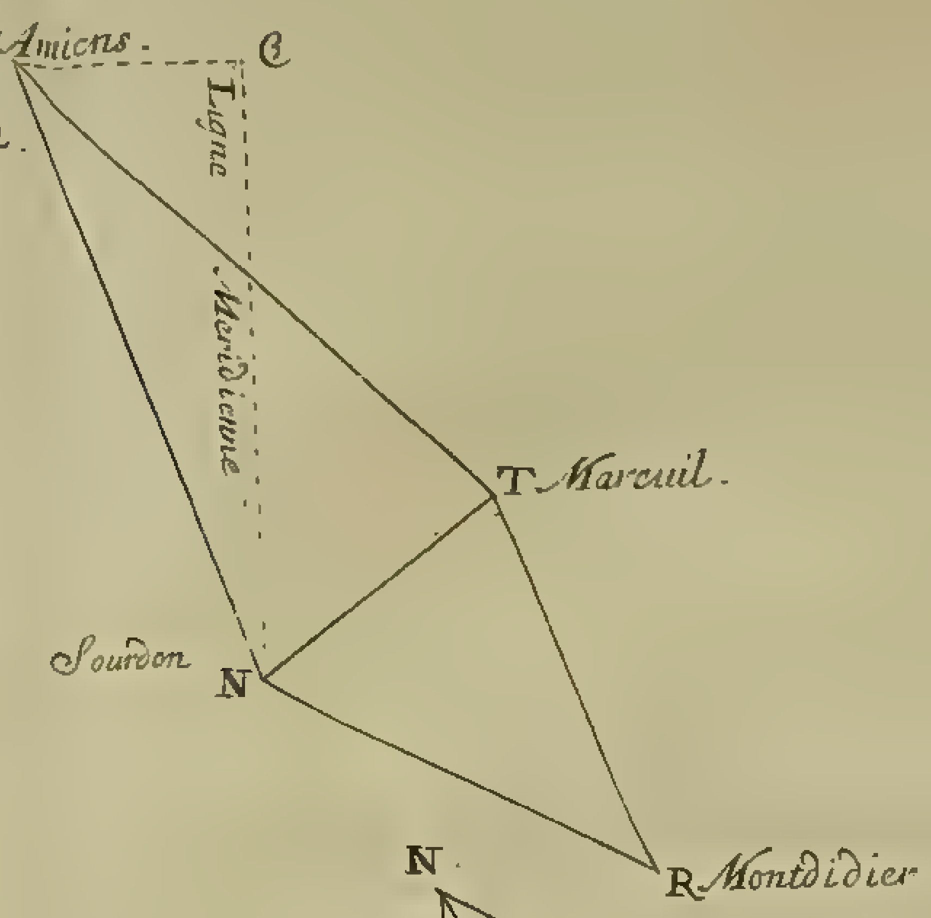


Fig. 2.



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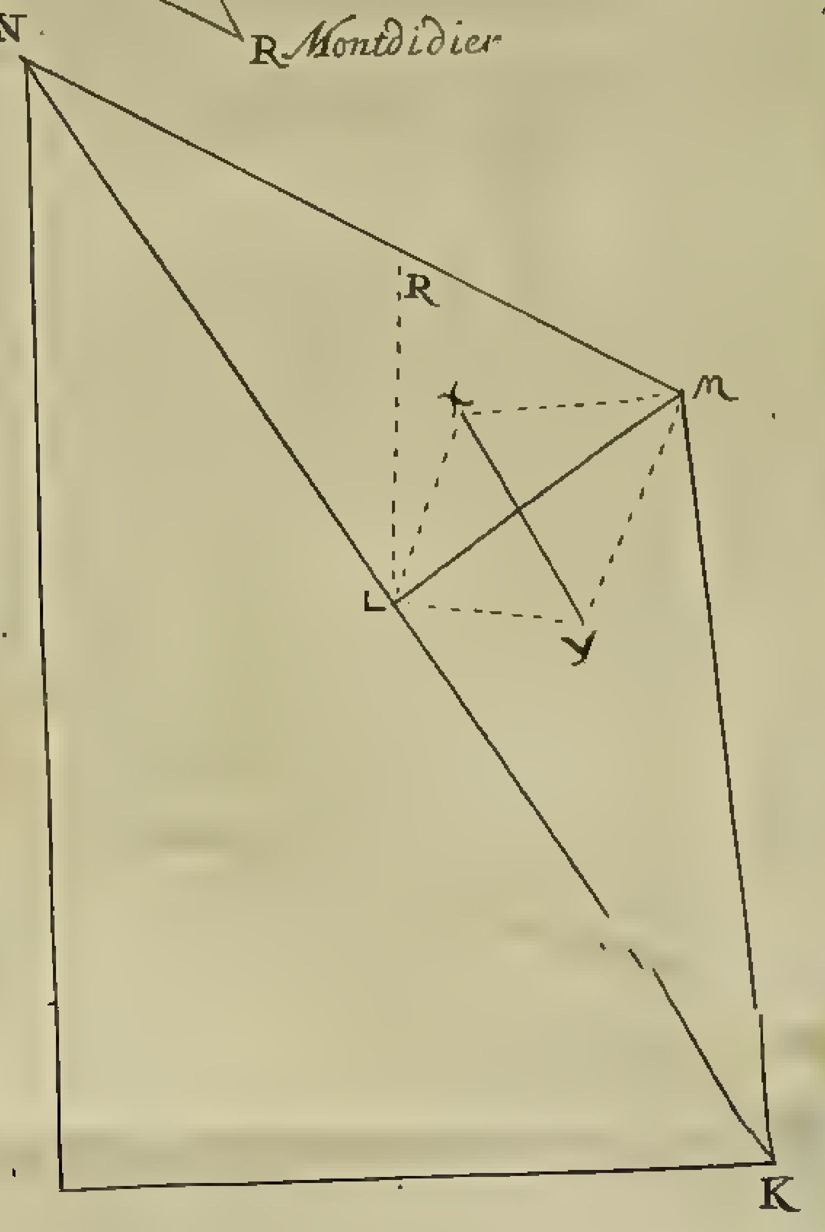
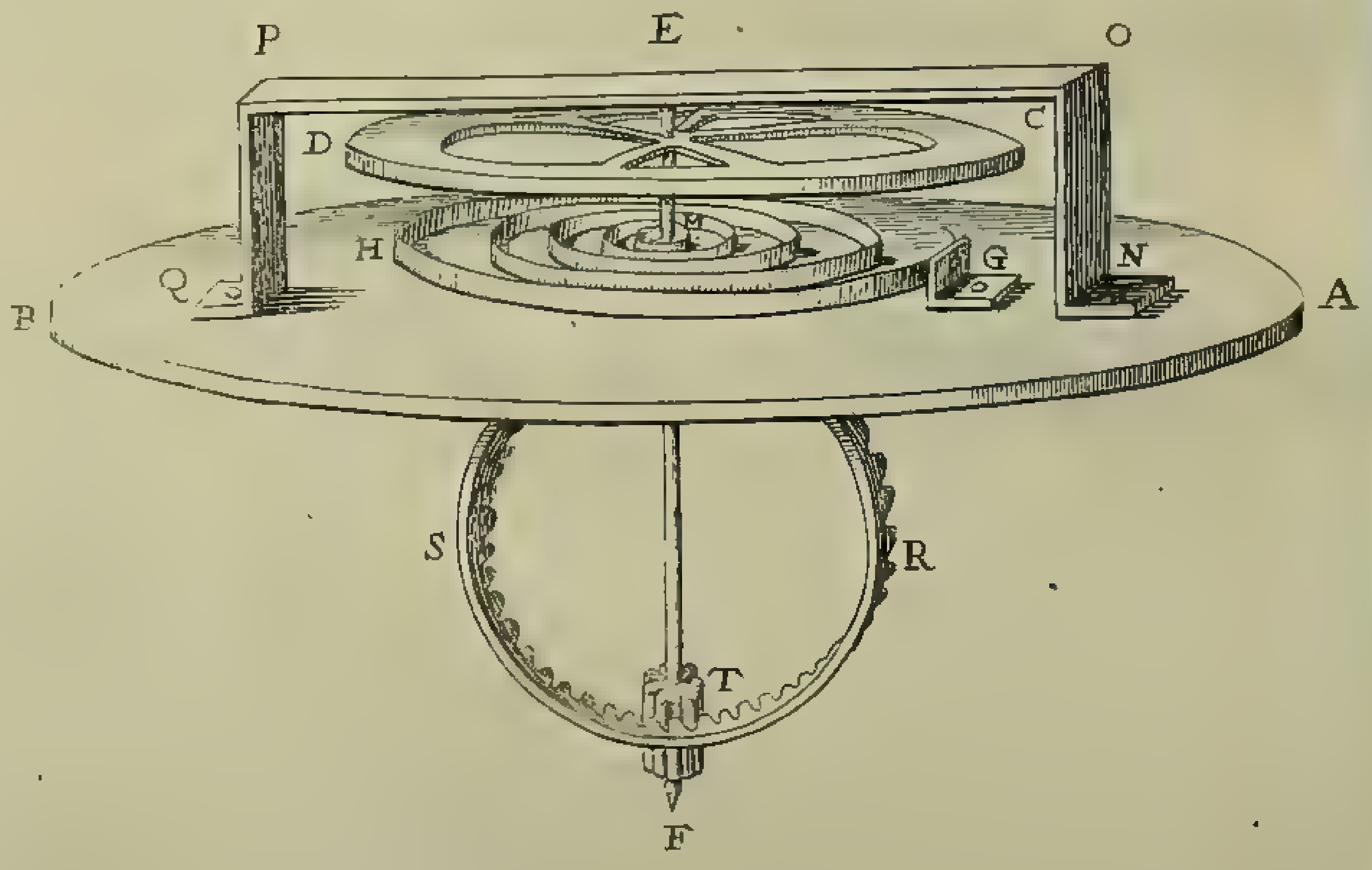


The Watch of M. Hugens.



BRITISH MUSEUM NATURAL HISTORY

Numb. 112.
Beginning the Eleventh Year.

PHILOSOPHICAL TRANSACTIONS.

March 25. 1675.

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INTRODUCTION TO THE Eleventh Year of theſe TRACTS.

IN theſe *Ten* years laſt paſt, from *March* 1665, to this preſent *March* 1675, through Gods aſſiſtance I have publiſh't *Nine* ſmal Volums of *Philoſophical Tranſactions*; the *firſt* Volum containing the Tranſactions of the *firſt* and *ſecond* of thoſe years: And now, to begin a *Tenth* Volum for the *Eleventh* year (which I intend, God willing, to collect,) I apprehend it my duty in the firſt place gratefully to acknowledge the *Ingenuous Supplyes*, which have been favourably afforded me, both by our eminent *Domeſticks* within *his Majeſties* Dominions, and alſo by *Forrainers* of ſome of the beſt note.

From our Learn'd Correſpondents from many parts we have received very obliging ſatisfaction, ſuch as doth in a good meaſure anſwer our hopes and ſollicitations publiſhed near the end of the Introduction of our *Fourth* Volum. If I may expreſs it by a reſemblance, I may ſay; Some do freely lay out their ſtrength and exquiſite skill to unlock the *Cabinets of Nature*, to cleave and break up the hardeſt rocks, and to draw forth the richeſt Ores: Others are buſied in melting them down: Some in refining them, and ſome in forming them into divers kinds of neceſſary or helpful Utenſils. Many hands and heads are buſied to ſearch into the Origin of all Natural Bodies that are within our Sphære, or within our Reach; to examine the minuteſt principles; and to purſue the largeſt extent, the general affections, ſtates, tendencies and inclinations, the contents, the ſeveral kinds, the operations, and the productions of all the great maſſes of Earth, Water, and Air; and to extort conſiderable detections from them by Fire, and by other curious devices, and by Mechanical contrivances. And theſe do ſucceed ſo well, that *Chymiſtry*, which ſo long and ſo lately was obſcured with un-intelligible Cantings and deluding Vapors, is now, in the hands of Worthy Philoſophers, become one of the cleereſt Interpreters of the moſt ſubtile abſtruſities in Nature. Mean while ſome are at immenſe labour in purſuit of the longeſt reaches in *Mathematicks*, whilſt others draw down the moſt pregnant branches of it for the moſt conſiderable of Human Uſes.

So that ſomething is done already, and much more may in time be done towards the Explication of the *Phænomena* of Nature by the *Union of Chymiſtry*, as it is now become ſincere, with Optical and other Mechanical aids, and with all the branches of Mathematicks, pure and mixed. Hence we have already obtained a more rational and cloſer Accompt of ſome of thoſe, which are reputed *Occult*, Qualities, than any of the *Peripatetick* Schools have yet given of thoſe which they acknowledge to be moſt *ſenſible* and obvious.

Others in all their *Travels* by Sea and Land make diligent Reſearches into the *Myſteries* of *Arts*, and for all Rarities and ſingularities; that ſo what is worthy to be acquired, or to be imitated, and may be attain'd in any *one* part of the world, may, (as Arts grow, and as knowledge ſpreads abroad) be communicated for the benefit of *all*.

And we are not deſtitute of Learned *Antiquaries*, who read much, and ſtudy to perfect *Chronologies*, which for ſome Ages may at good certainty record the great Changes of human affairs, the Revolutions of Kingdoms and Governments; the genius, faculties, addictions, and humors of Men in all ages; the Inundations, Earthquakes, Tempeſts, Heats, Droughts, Famines, Peſtilences, Epidemical Infections and unknown Diſeaſes, Comets, and other more ſtrange and unuſual *Phænomena*: Whilſt others are re-calculating the *Celeſtial Motions*, according to the accurateneſs of Modern diligence. Our greateſt want at preſent is of ſuch Antiquaries, as may throughly undertake to re-examine *Pancirolus*, to conſider the moſt proper *Succedanea*, and the revival of *Ancient* Arts. This we made bold to recommend in the *Preface* to our *Sixth* Volum near the end.

The *Ingenuous* Arts do furniſh Employments for the younger Deſcendents of generous Families; as Limming, Painting, Sculpture, Chalcography, Calligraphy, Architecture, Navigation, the Breeding of the beſt races of Horſes for all ſervices, the Cicuration of Animals; the Hortulan and all the other nobleſt kinds of Agriculture, as Vine-yards, Hop-yards, Mulberry-groves, Saffron, Liquorice, Woade, Madder, *&c.* That ſo all our Gentry may be good

Examples to the Vulgar, both in vanquiſhing lazineſs, and luxury alſo; as of old, Commanders and Conquerors were more famous for auſtere Sobriety, and more conſpicuous for ſolid Vertues, than for delicacies of Treatments, and for the ſplendor of their Equipage.

And yet, ſince good reaſon requires, that all ſhould be careful to ſend in *Proviſions* for them that are engaged in hardier ſervices for their Country; and ſince *Hoſpitality* hath a juſt praiſe; and it being alſo a chief point of Practical Philoſophy, to ſupply Food and Rayments, and other Requeſts for all Mankind: I may here take notice, that I have heard it boldly affirmed, that there is not a *wholeſom* Vegetable in the world, if it be not odious to the guſt, or too ſtrongly Medical, whoſe roots, or ſeeds, bloſſoms or leaves, fruit, ſtems or pulp, may not, by Decoctions, Infuſions, or Extracts, with a mixture of ſome Sugar, and ſeaſonable Ferment, yield food or liquors, to ſuſtain, corroborat, reſtore and revive men. And 'tis believed, that a Juyce drawn from the *freſh* Sugar-cane, doth reſemble, and may challenge, or excel, the richeſt wine of the Grape.

In this Teſtimony, I confeſs, my aim is for the benefit of *Jamaica*, and our other Sugar-Plantations. *Meibomius* hath accounted ſufficiently for the *old* Beverages; and our *Weſt-Indian* Colonies can increaſe the number of *rich* Liquors, if they pleaſe to do it. We hear of their Casks of Orenge-wine; and we know not yet, what their Lemons, or other delicious fruit will do. We have no news yet of the arrival in *England* of Ligons *Queen-Pine*, ſo much extoll'd by his judicious palat; or that the Liquor of it is brought hither without decay by any Art. And we ſhould not deſpair of our own, ſince the *Dutch* had the wit to make the tops of our *Sage* dryed paſs in *China* for a far more precious *Thea*, than their coſtly Thea is to us; and our *Baume* hath the Bees ſuffrage for the beſt Hony; and our Engliſh *Saffron* gives much life to our beſt Elixirs.

For *Foods*, our late Books of *Cookery* do ſay too much rather than too litle, and declare ſufficiently, that an *ingenioſa gula* is not wanting amongſt us; and yet none have ſaid enough of the *extent* of nutriment in caſes of Neceſſity, as in Sieges, and on the Seas in long calms, or when by ſtorms they have loſt their Sails, Maſts, Sterns, *&c.* Perhaps it may be found, that Sea-plants and the Earth it ſelf may yield *food* and *bolus's*, as wholeſome for nouriſhing, as they do for medicine. All the Seas and Rivers, and all Lands do offer plenty and variety for our Tables; and may, in time, for our Garments: The *Seas* to yield as good and ſtrong Rayments as Buffe or Mayle; as the dull Inhabitants of large Territories in the *North* had the wit, long ſince, and have to this day, to wear ſhoes and boots of *Fiſhes skins*, ſo cleaverly ſow'd, that their Seams are not eaſily to be found, ſaith M. *Martinier* in his New Voyage into the Northern Countries: And that the beſt ſort of men in *Nova Zembla* do wear Veſtments of the feather'd Skins of *Penguins*, the feathers outwards; and make Boats and Canoes of Fiſh-skins and Fiſh-bones. And we expect better tidings from the New Arts of *Diving*, concerning the Treaſures of the Seas, ſuch perhaps as have layn *ab origine*, and have perpetually increaſed by ſhipwracks and tempeſts. Excellent Volums do offer many Artifices for all occaſions and for all humors; and great Ingeny's will have the wit, rather to chuſe to be Maſters and Inventors of a New and Ingenuous Artifice, than to ſerve our Apprenticeſhip for that which is Vulgar and proletary: No Statute or Law prohibits a man to practiſe an Invention of his own in any Corporation, if it be for common Utility, and without fraud; but one may not ſet up a known Trade, till he hath ſerved an Apprenticeſhip. But I muſt not here, nor am I able, to enumerate all the Branches of Philoſophy which are advanc'd for this preſent age, and prepar'd for the future. Enough is done to quicken honeſt Wit, and Induſtry, which is generally moſt of all wanting in moſt of them that complain of Want.

A more particular Account of the laſt Eclipſe *of the* Moon, *as it was obſerved by the* Pariſian *Aſtronomers, and promiſed by us in our former* Numb. 111. Engliſh't *out of the* French Journal *des* Scavants.

JAnuary 11. 1675. about five a clock 12 *min.* in the Evening, in the Royal Obſervatory, M. *Caſſini*, M. *Picard*, and M. *Roemer*, began to perceive, that the Oriental part of the Moon, by little and little loſt its light; ſo that at 5 *h.* 25'. they ſaw a manifeſt *penumbra*; then at 5 *h.* 3[illegible]'. 50". the limb over againſt the Spot called *Hevelius* grew ſo dark, that they all agreed, that this was the true beginning of the Eclipſe. They ſaw yet the little Spot *Riccioli*, which diſappeared not till 15'. after; and ſo the Shadow advanced from ſpot to ſpot unto the other oppoſite limb of the Moon, according to the order below particulariz'd.

Before the Moon was almoſt altogether immerſed into the Shadow of the Earth, there appear'd not any ſenſible Light in the part Eclipſed, as well by reaſon of the brightneſs of the other part yet remaining to be darkened, as of ſome little Miſt then being about the Moon. But that Miſt being diſpelled, the Moon totally Eclipſed looked of a colour red-brown. The Eaſtern part, which was obſcured firſt, appear'd at firſt more duskiſh than the other, and its blackneſs increaſed according as the Moon entred more and more into the Shadow of the Earth; but a while after, the ſame blackneſs paſſed to the other ſide of the Moon, ſo that the Weſtern part became in its turn to be of a rediſh colour, browner and darker than the other.

At 8 *h.* 7'. the Limb that is about the Spot *Grimaldi*, and which was then next the Horizon, began to clear up: Which made one of the Obſervers believe, that it was the beginning of the Emerſion. But, the whiteneſs of this Limb not being then yet great enough, the two other Obſervers judged this return of Clearneſs a little later, the one at 8 *h.* 8'. and the other at 8 *h.* 9'. 30". Yet having in the ſequel, a regard to the time of the diſcovery of the firſt Spots that came after, they all eſteemed the firſt Emerſion to have been at 8 *h.* 8'. And this ſhews what is to be expected from the Eclipſes of the Moon for the determination of the Longitudes, when the Obſervers do content themſelves barely to remark the beginning and the end of the Eclipſe.

During the greateſt Obſcuration, *viz.* at 7 *h.* 21'. the Southern Limb of the Moon was come cloſe to a ſmall Star, of the number of thoſe that cannot be ſeen without a Teleſcope; which was compar'd with the Moon, by taking its diſtances from the Moon and the Shadow before the total Immerſion, and afterward until the firſt Immerſion; with a deſign, by means thereof to find the *Parallax* of the Moon. A little after the beginning of the Emerſion, *viz* at 8 *h.* 9'. 20", another Star, yet leſs than the former, came out at the darkeſt ſide, almoſt over againſt the Spot *Langrenus*; which place was taken but to be near ſo, becauſe then they could diſcern nothing in that part, though they ſaw well enough the whole contour or compaſs of the Moon.

Laſtly, at 9 *h.* 9'. 40". all the three Obſervers agreed, that the Moon then came out of the Shadow; but there remained a *Penumbra*, which laſted for ſometime after.

The *Diameter* of the Moon, being meaſured before the Eclipſe, was of 32′. 15″. 'Tis true, that when ſhe was wholly Eclipſed, ſhe was found leſs by ſome Seconds than before the Eclipſe: But ſince 'tis difficult to meaſure her in that State, there is reaſon to doubt of this Obſervation.

The *Times* were noted by great Pendulum-Watches, that had been adjuſted by the Sun the ſame day, and that were afterwards verified the next day: Beſides, that before the Eclipſe at 4 *h.* 45′. 1″. by the Watches, the Star *Capella* was 45 degrees high towards the Eaſt.

The Particulars, above directed to.

Time.	The Paſſages of the Shadow.
H. M. S.	
5. 32. 50.	Beginning *Over againſt the Spot Hevelius.*
36. 0.	*the firſt Spot of Grimaldi.* Palus Mareotis.
36. 30.	*the ſecond limb of Grimaldi.*
45. 0.	*the middle of Ariſtarchus.* Mons Porphyrites.
46. 0.	*Merſennus.*
48. 30.	*Herigone.*
53. 0.	*Heraclides.*
53 15.	*the firſt Limb of Copernicus.* Ætna.
54. 15.	*the middle of Copernicus.*
54. 40.	*Pitheas, or* Hiera Inſula.
55. 5.	*the ſecond Limb of Copernicus.*
57. 40.	*the firſt Limb of Timocharis.* Corſica.
59 35.	*the firſt Limb of the Sinus medius Æſtuum.* Adriatick Sea.
6. 1. 30.	*the middle of the Sinus medius.*
2. 40.	*the firſt Limb of Tycho or* Sinai, *and the firſt Limb of Plato, or the* Lacus niger major.
3. 50.	*the ſecond Limb of Plato, and the middle of Tycho.*
4. 30.	*the Centre of the Diſque.*
9. 0.	*the middle of Manilius, or* Mons Besbicus.
12. 0.	*the middle of Menelaus, or* Byſantium.
13. 45.	*Dionyſius Areop. or* Mons Amanus.

Time.

Time.		The Paſſages of the Shadow.
6. 14.30.		***Over Plinius.***
15.45.		*Vitruvius.*
20.35.		*Endymion, or* Lac. Hyperbor. ſuperior.
21. 0.		*Promontor. Heraclium.*
24.50.		*Betwixt Alcuin and Taruntius.*
26. 0.		*the firſt Limb of the Caſpian Sea, Mare Criſium.* Palus Mæotis.
28.15.		*the middle of the Caſpian Sea.*
29.40.		*the other Limb of the Criſpian Sea.*
30. 5.		*the firſt Limb of Langrenus, or* Inſula Maj.
3. 5.		*the middle of Langrenus.*
35.46.	Total Immerſ.	*Betwixt Langrenus and the Caſpian Sea.*
8. 8. 0.	I. Emerſion,	*Towards Grimaldus.*
12.35.		*the firſt Limb of Grimaldus.*
14. 0.		*the ſecond Limb of Grimaldus.*
20.20.		*Merſennus.*
24. 5.		*Herigone.*
24.35.		*the middle of Ariſtarch. and the middle betwixt Herigen and Morin.*
26.30.		*the middle of Kepler, or* Loca paludoſa.
28.30.		*the firſt Limb of Tycho.*
29.50.		*the ſecond Limb of Tycho.*
34. 5.		*the middle of Copern.*
35.35.		*the ſecond Limb of Copern.*
36.10.		*Pitheas.*
36.30.		*Heraclides.*
40. 0.		*the firſt Limb of Timocharis.*
42.35.		*the firſt Limb of Plato.*
43.45.		*the ſecond Limb of Plato.*
49.30.		*the middle of Manilius.*
52.10.		*Menelaus and Dionyſ. Areopag.*
55. 0.		*Poſſidonius.*
56. 6.		*Vitruvius.*
59.30.		*Endymion.*
9. 6.20.		*the firſt Limb of the Caſpian Sea.*
7.10.		*the middle of the Caſpian Sea.*
8.40.		*the other Limb of the Caſpian Sea.*
9.40.	The End.	*Between the Caſpian Sea and Langrenus.*

A

A Breviate of Monſieur Picarts *Account of the Meaſure of the Earth.*

THIS Account hath been printed about two years ſince, in *French*; but very few Copies of it being come abroad, (for what reaſons is hard to divine;) it will be no wonder, that all this while we have been ſilent of it. Having at length met with an Extract thereof, and been often deſired to impart it to the Curious; we ſhall no longer reſiſt thoſe deſires, but faithfully communicate in this Tract what we have received upon this Argument from a good hand.

The Author then, whoſe name is not prefixed to the Book (though generally 'tis thought to be the Intelligent and Learned *Picartus*, an Eminent member of the Royal Academy of the Sciences at *Paris*,) divides his Treatiſe into 13. Articles; of which we ſhall firſt of all repreſent the ſum, as 'twere, in one view; and then, for the ſatisfaction of the more curious, deliver the Breviat of every Article.

The Sum then of the whole amounts, in ſhort, to this; That the French Author hath found 57060 toiſes or fathoms for one degree, that is, 28½ leagues and 60 toiſes; which being multiplyed by 360 (the number of the degrees) makes 10270 leagues and 1600 toiſes, reckoning 2000 toiſes to a league, or 2400 paces, 5 foot to a pace. The Method employ'd by him hath been, To meaſure on a plain and ſtraight ground a ſpace of 5663 toiſes, to ſerve for the firſt *baſis* to divers Triangles, by which he hath concluded the Length of a Meridian line to be equivalent to a degree. That which is remarkable for the certainty of this Obſervation, is, 1. That no body, we know of, hath ever meaſur'd ſo great a *baſis*; the greateſt of the former Obſervations having been but of a 1000 toiſes. 2. That here have been emploied, for taking the Angles of poſition, very accurate Inſtruments, and Teleſcopical Sights inſtead of common ones; all deſcribed in the ſaid Book: of which we ſhall now proceed to deliver the import of every Article.

In the *firſt* then, he begins with a Preamble, ſhewing, that this Probleme concerning the Juſt Dimenſions of the *Circumference of the Earth* is no New thing, but hath been the Inquiry of ſeveral Ages, in which Princes have been curious, and Learn'd men encouraged to the ſearch and clearing of this Difficulty. And to this purpoſe he alledges a paſſage out of *Abulfeida*, to this effect, that *Almamon*, a Prince of the *Arabes*, deſirous to know, what the True meaſure of a Celeſtial *Degree* might be upon Earth, commanded the Experiments to be made in the Plains of *Sanjar*; where a Station being choſen, and thence Troups of Horſemen let out, that went in a ſtraight line, till one of them had raiſed a degree of *Latitude*, and the other had depreſt it; at the end of both their marches, they who raiſed it, counted $56\frac{2}{3}$ miles, and they who depreſt it, reckon'd 56 miles juſt. This Obſervation can inſtruct us but very little, becauſe we know not juſtly, of what length theſe miles were. Then, the Author obſerves, that the Ancient computations of miles for a Degree run alwayes upon the decreaſe; ſo as *Ariſtotle* counting to a Degree 1111 *ſtadia*, after him *Eratoſthenes* counted but 700; *Poſſidonius* but 666; *Ptolomy* but 500. Nor do theſe Obſervations teach us any thing certain, becauſe the preciſe length of theſe *ſtadiums* is unknown to us; and they were alſo different among themſelves; the *ſtadia* of *Alexandria* differing from thoſe of *Greece*. At laſt *Fernelius* brought it to 56746 *Toiſes* or Fathoms of *Paris*, each of which is equal to 6 *Pariſian* feet; *Snellius*, to 55021.

In the ſecond *Article*, he judges *Snellius* his way of meaſuring to be the moſt artificial; which was by a *Scale* of *Triangles*. But in one thing he eſteems it deficient, which is, that *Snellius* took his Object only by Pinnules, or Common Sights, which do not ſo diſtinctly point it out.

See Fig. I. Tab. 1.

In the *third* Article he begins to ſpeak of his own Method, and its exactneſs, and ſaith, That, when the reſolution was taken of *Meaſuring a Degree*, he choſe his *Meridian*, out of which he intended to take his Meaſure, between *Sourdon* in *Picardy*, and *Malvoyſin*, which is upon the confines of the *Gaſtinois* and *Hurepois*. To attain the exact Meaſure of this Arch of the Meridian, lying between *Sourdon* and *Malvoyſin*, he ſaith, he actually meaſur'd a way that lay very ſtraight, between *Villejuifve* and *Ivoiſy*, viz. A.B.; And he began to meaſure from the middle of a Mill at *Villejuifve*, and continued till he came to the Pavillon of *Ivoiſy*, and found the diſtance between theſe two termes, in going forward, to be 5662 toiſes and 5 feet, and in comming back, 5663 toiſes and 1 foot; which being meaſured with great exactneſs, he ſtated the diſtance between theſe two places, in round reckoning, 5663 toiſes.

The Inſtrument he meaſured with, was Pikes joyned together at their ends by a ſcrew, which meaſure was 4 toiſes long: This he applied along a cord ſtretched horizontally, and at the end of every ſuch Pike had a ſtake; of which ſtakes he had 10 in all. This diſtance of 5663 toiſes was the Baſe of the *firſt* Triangle, upon which the meaſure of all the depending ſcale was formed.

Here in *Art.*4. he takes occaſion to diſcourſe of *Meaſures* in general, and ſaith, That a *Pendul* vibrating a *ſecond* of time, computed according to the *Mean* motion of the Sun, is 36 inches and $8\frac{1}{2}$ lines of the Chaſtelet of *Paris* meaſure. And he eſteems, that this Meaſure may probably ſerve in all Countries, becauſe the ſame Length of a Pendul ſerved for a *Second* both at the *Hague* and *Paris*; whence he conjectures, the ſame may ſerve alſo in other Latitudes. Whereupon he inferrs, that if one had a mind to conſtitute an *Univerſal Meaſure*, which might be common to all Countries, it might be thus made, *viz.*

Call this Pendul for *ſeconds* (of 36 inches and $8\frac{1}{2}$ lines) the Aſtronomical *radius*; the $\frac{1}{3}$ of this *radius* the *Univerſal foot*; the double of which *radius* might be called the *Univerſal Toiſe* or Fathom, which would be to the *Pariſian Toyſe* as 881. to 864; the Quadruple might be called the *Univerſal Perch*, which is equal to the length of a Pendul for *two* ſeconds. In a word, the *Univerſal Mile* might contain a 1000 of theſe Perches.

The Inſtrument, (in *Art.*5.) wherewith the Angles were taken in the Menſuration of the Triangles, was a Quadrant of 38 Inches *radius*, furniſh't with Teleſcopical-glaſſes, the better to point out the Objects: Which Inſtrument, he ſaith, never miſs'd a minute in taking an Angle; ſometimes it came within *five* ſeconds.

But to proceed; In the *ſixth* Article he relates the Manner of taking the Diſtance between *Sourdon* and *Malvoyſin*, together with the Triangles, and the Stations from whence he obſerv'd his Angles. This diſtance is 68343 toiſes and 2 feet.

The *Baſe*, which he actually meaſur'd, as we ſaid above, was AB, the high way lying between *Villejuifve* and *Ivoiſy*, which he found, (as hath been already intimated) equal to 5663 toiſes of *Paris*. And from this Baſe he deduced the meaſure of all the 13 Triangles, *viz.*

In the *firſt* Triangle ABC, to find the ſide AC, BC.

$$\text{Angles}\begin{cases}CAB=54^\circ.\ 4'.\ 35''.\\ ABC=95.\ 6.\ 55.\\ ACB=30.\ 48.\ 30.\end{cases}$$

	Toiſes.	Feet.
The Side AB is	5663.	of actual meaſure.
Hence A C is	11012,	5.
B C	8954.	0.

In the *ſecond* Triangle, ADC, to find DC and AD.

$$\text{Angles}\begin{cases}DAC=77^\circ.\ 25'.\ 50''.\\ ADC=55.\ \ 0.\ 10.\\ ACD=47.\ 34.\ \ 0.\end{cases}$$

	Toiſes.	Feet.
The Side AC is	11012.	5.
Hence DC	13121.	3.
AD	9922.	2.

In the *third* Triangle, DEC, to find DE, CE.

$$\text{Angles}\begin{cases}DEC=74^\circ.\ \ 9'.\ 30''.\\ DCE=40.\ 34.\ \ 0.\\ CDE=65.\ 16.\ 30.\end{cases}$$

	Toiſes.	Feet.
The Side DC	13121.	3.
Hence DE	8870.	3.
CE	12389.	3.

In the *fourth* Triangle, DCF, to find DF.

$$\text{Angles}\begin{cases}DCF=113^\circ.\ 47'.\ 40''.\\ DFC=\ 33.\ 40.\ \ 0.\\ FDC=\ 32.\ 32.\ 20.\end{cases}$$

	Toiſes.	Feet.
The Side DC	13121.	3.
Hence DF	21658.	0.

In the *fifth* Triangle, DFG, to find DG, FG.

$$\text{Angles}\begin{cases}DFG=92^\circ.\ \ 5'.\ 20''.\\ DGF=57.\ 34.\ \ 0.\\ GDF=30.\ 20.\ 40.\end{cases}$$

	Toiſes.	Feet.
Side DF	21658.	0.
Hence DG	25643.	0.
FG	12963.	3.

In the *ſixth* Triangle, GDE, to find GE.

The Angle GDE = 128°. 9′. 30″.

		Toiſes.	Feet.
The Sides	DG	25643.	0.
	DE	8870.	3.
Hence	GE	31897.	0.

So then, the Line of Diſtance between *Malvoyſin* and *Sourdon* being divided into three parts, *viz.* EG, GI, IN, the part EG is already found.

In the *ſeventh* Triangle FGH, to find GH.

Angles
FGH = 39°. 51′. 0″.
FHG = 91. 46. 20.
HFG = 48. 22. 30.

		T.	F.
The Side	FG	12963.	3.
Hence	GH	9695.	0.

In the *eighth* Triangle GHI, to find GI, IH.

Angles
GHI = 55°. 58′. 0″.
GIH = 27. 14. 0.
IGH = 96. 48. 0.

		T.
The Side	GH	9695.
Hence	GI	17557.
	HI	21037.

Thus the *Second* part of the Three, *viz.* GI, is found.

In the *ninth* Triangle HIK, to find IK.

Angles
HIK = 65°. 46′. 0″.
HKI = 80. 59. 40.
KHI = 33. 14. 20.

		T.
The Side	HI	21043.
Hence	IK	11678.

In the *tenth* Triangle IKL, to find KL, IL.

Angles
LIK = 58°. 31′. 50″.
IKL = 58. 31. 0.

		T.	F.
The Side	IK	11683.	0.
Hence	KL	11188.	2.
	IL	11186.	4.

In the *eleventh* Triangle KLM, to find LM.

Angles { LKM=28°. 52′. 30″.
KML=63. 31. 0.

	T.	F.
The Side KL	11188.	2.
Hence LM	6036.	2.

In the *twelfth* Triangle LMN, to find LN.

Angles { LMN=60°. 38′. 0″.
MNL=29. 28. 20.

	T.	F.
The Side LM	6036.	2.
Hence LN	10691.	0.

In the *thirteenth* Triangle ILN, to find NI.

The ſum of the Angl. IKL, KLM, MLN, taken from 360, there remains Angle ILN=119°. 32′. 40″.

	T.	F.
The Sides { LN	10691.	0.
IL	11186.	4.
Hence IN	18905.	0.

Thus, the Line of Diſtance, EN, being, as hath been ſaid, divided into three unequal parts, EG, GI, IN, the meaſures of all three are found by this Scale of Triangles.

Now then, reaſſuming what hath been already diſcover'd by the help of theſe Triangles, and finding, that

	Toiſes.
EG was in length	31897.
GI	17557.
IN	18905.

Theſe added together, make the length of EN, which is the Line of Diſtance between *Malvoyſin* and *Sourdon*, viz. 68359.

Now to continue this meaſure from *Sourdon* to *Amiens*, (which is the buſineſs of the *ſeventh* Article, undertaken to the end that *Fernelius* his account might be liquidated, whether it were true or no;) you muſt, for the attaining it, make uſe of the Diagram of Fig. 2; where R. ſtands for the Steeple of St. *Peters* in *Montdidier*; T. is a Tree upon the Hill of *Mareuil*; V. is the Lantern of *Noſtre Dame* of *Amiens*.

To find the diſtance NV, you muſt look back upon NLM, the laſt Triangle of Fig. 1, and ſee, how it is diſpoſed in Fig. 3; where in the Triangle LMR, The Angles $\begin{cases}\text{LMR}=58^\circ.\ 21'.\ 50''.\\ \text{MRL}=68.\ 52.\ 30.\end{cases}$

T. F.
The Side LM 6037. 0.
Hence L.R 5510. 3.

In the Triangle NRL.

The Angles $\begin{cases}\text{NRL}=115^\circ.\ 1'.\ 30''.\\ \text{RNL}=\ 27.\ 50.\ 30.\end{cases}$

T. F.
The Side LR 5510. 3.
Hence NR 7122. 2.

Go on to Fig. 2. in the Triangle NRT.

The Angles $\begin{cases}\text{NTR}=72^\circ.\ 25'.\ 40''.\\ \text{TNR}=67.\ 21.\ 40.\end{cases}$

T. F.
The Side NR 7122. 2.
Hence NT 4822. 4.

Finally in the Triangle NTV,

The Angles $\begin{cases}\text{NTV}=83^\circ.\ 58'.\ 40''.\\ \text{TNV}=70.\ 34.\ 30.\end{cases}$

T. F.
The Side NT 4822. 4.
Hence NV 11161. 4; which was ſought.

T. F.
Now, adding the Diſt. between *Malvoyſin* & *Sourdon*, *viz.* 68359. 0.
to the diſtance between *Sourdon* and *Amiens* 11161. 4.
The whole will be the diſt. between *Malvoyſin* & *Amiens* 79520. 4.

Having thus meaſured the particular diſtances between *Malvoyſin*, *Mareuil*, *Sourdon*, and *Amiens*, he proceeds to examine, in the *eight* Article, the Poſition of each of theſe Lines of diſtance in reſpect of the *Meridian*, or to deduce the Length of the Meridian intercepted between the Parallels of *Malvoyſin* and *Amiens*: Which was thus done;

In *Septemb.* 1669. he went to the Hill of *Mareuil*, and from the top of it, which is mark't with G in *Fig.* 1. (from whence one can diſcern *Clermont* on one ſide, at I, and *Malvoyſin* on the other ſide, at E.) he took the *Meridian*, and with a Quadrant took the Angles of Declination from this Meridian. The manner he relates at length; the reſult whereof is, That by theſe Obſervations he found, The Angle EGε in *Fig.*1, which is the Declination of EG from the Meridian weſtward gr. ′ ″ 0. 26. 0.

The Angle GIθ, which is the Declination of G I from the Meridian Eaſtward 1. 9.

The Angle INV, which is the Declination of IN from the Meridian Eaſtward 2. 9. 10.

The Angle VNβ in *Fig*. 2. which is the Declination of NV from the Meridian Weſtward 18. 55. 0.

So that in all theſe 4 Triangles, EGε, GIθ, INV, VNβ, you have two Angles known (for the Angles at ε, at θ, at V, at β, are right,) and a ſide, *viz.* EG. GI. IN. NV. whene he concludes, Toiſes. Feet.

The length of the Meridian Gε to be 31894. 0.
of the Meridian I θ 17560. 3.
of the Meridian NV 18893. 3.
of the Meridian N β 10559. 3.

And hence the length of the whole Meridian α β between the Parallels of *Malvoyſin* and *Amiens* to be 78907. 3.

Here he caſts in an Objection, and ſaith, that theſe Lines, which make up the Meridian, are not, in a ſtrict ſenſe, a Curve, but in reality the ſide of a Polygone circumſcribed about the Circumference of the Earth. But, for anſwer to this, he affirms the Difference between thoſe Lines and a true Curve to be but 3 foot *per* degree, which he ſaith is ſcarce worth taking notice of. This he proveth afterwards, where he makes the Table, in which he calculates, what difference there is between the real Level and the apparent.

To this he ſubjoyns a Note, importing, that though he took theſe Meridians, for greater exactneſs, with a Quadrant; yet he omitted not to uſe a Compaſs, whoſe Declination to the *Weſtward*, he ſaith, in the Year 1670, towards the end of the Summer, he found 1°. 30′.

Whereas *A.*1666. he obſerved very little variation, if any at all.

But *A*. 1664. it varied *Eaſt-ward* 0. 40.

Here he makes a pretty Note, telling us, that the Difference of Variation in a years time amounts to 0. 20′.

The Length of the Meridian between *Malvoyſin* and *Amiens* being thus ſtated, his next buſineſs is, in the *ninth* Article, to enquire, What anſwers to it in the Heavens, comparing thoſe Meridian diſtances, already meaſur'd, with *Minutes* and *Seconds* there: which were taken by the help of an Inſtrument, whoſe Limb was an Arch of $\frac{1}{20}$ of a Circle of 10 foot *radius*; whereof he gives the *Figure*, and his manner of rectifying any Errors, which in uſing it might deceive him.

In the *tenth* Article he relates, that the *knee* of *Caſſiopeia* was the Starr he pitch't on, from whence to meaſure the *Minutes* and *Seconds* of a Degree in the Heavens; adding the reaſons, why he choſe that Starr.

In the *eleventh* he gives the reſolution of the thing in Queſtion, that is to ſay, How many Toiſes or Fathoms, *Pariſian* meaſure, anſwer a *Degree* of the *Circumference* of the *Earth*; as for inſtance, the Difference of Latitude between *Malvoyſin* and *Sourdon* is found, by Obſervations made in the Heavens, to be 1°. 11'. 57".
Between *Malvoyſin* and *Amiens* 1. 22. 55.

Now, the Meridian diſtance between *Malvoyſin* and *Sourdon*, calculated from Meaſures taken upon Earth, was, as may be ſeeen above; Toiſes. Feet. 60430. 3.

Whence 'tis concluded, that 57064 Toiſes and 3 feet, or, in a round number, 57060 Toiſes are equal to a *Degree*.

Which if you would reduce to *Univerſal Meaſure*, you are to remember, that the *Univerſal* toiſe is to the *Pariſian*, as 881 to 864: Whence one Degree is equal to 55959 Toiſes *Univerſelles*.

The Reduction of which to the meaſures of other Countries is this;

	parts.
Suppoſe the *Paris* foot to conſiſt of	1440.
The *Rhynland* (or Leyden) foot, contains of theſe	1390.
The *London*-foot	1350.
The *Bolonian*-foot	1686.
The Braccia of *Florence*	2580.

Hence a *Degree* in a grand Circle of the Earth, according to the Meaſures of different Countries, is,

Toyſes du Chaſtelet de Paris	57060.
Pas de Bologna	58481.
Verges du Rhin *de* 12 *pieds chacune*	29556.
Lieuës Pariſiennes de 2000 *Toiſes chacune*	$28\frac{1}{4}$.
Lieuës moyennes de France d'environ 2282 *Toiſes*	25.
Lieuës de marine, de 2853 *Toiſes*	20.
Milles d' Angleterre, *de* 5000 *pieds chacune*	$73\frac{7}{100}$.
Milles de Florence, *de* 3000 *braſſes*	$63\frac{7}{10}$.

Hence

Hence the *Circumference* of the *Earth*,

In Pariſian Toiſes or Fathoms	20541600.
In Leagues of which 25 make a Degree	9000.
In Marine Leagues	7200.

The *Diameter* of the *Earth* is,

In Pariſian Toiſes	6538594.
In Leagues of 25 to a Degree	$2464\frac{56}{71}$.
In Marine Leagues	$2291\frac{19}{71}$.

He alſo gives a Table, ſhewing the Correſpondent value in meaſure to the parts of a Degree: E. g.

Min.		Toiſes.	Second.		Toiſes.
1	=	951	1	=	16.
2	=	1902	2	=	32.
60	=	57060	60	=	951.

After this follows a Table of the Difference of Latitude, which is

Between *Malvoyſin* and the *Obſervatoire* of *Paris*		19′. 22″.
Between *Malvoyſin* and *Noſtre Dame de Paris*		20. 22.
Between *Malvoyſin* and	*Mareuil*	33. 32.
	Clermont	52. 0.
	Sourdon	71. 52.
	Noſtre Dame d' Amiens	82. 58.
Between *Noſtre Dame* of *Paris* and of *Amiens*		62. 36.

Then follows a Table of Elevations of the Pole of ſeveral places, as

The Elevation of the Pole	In the Garden of the R. Academy at *Paris* is,	48°. 58′. 0″.
	At *Noſtre Dame de Paris*	48. 52. 10.
	At St. *Jaques dela Boucherie*	48. 52. 20.
	At *Malvoyſin*	48. 31. 48.
	At the *Obſervatoir* of *Paris*	48. 51. 10.
	At *Marevil*	49. 5. 20.
	At *Clermont*	49. 22. 48.
	At *Sourdon*	49. 43. 40.
	At *Noſtre Dame d' Amiens*	49. 54. 46.

As to Differences of Longitudes;

Sourdon	more Eaſterly then	*Amiens*	by	0°. 5'. 54''.
Clermont		*Sourdon*		0. 1. 9.
Mareuil		*Clermont*		0. 0. 34.
Mareuil		*Malvoyſin*		0. 0. 20.
Mareuil		*Paris*		0. 4. 37.

So much of the *eleventh* Article. The *twelfth* is framed upon an *Objection*, that might be made, *viz.* Whether the Meaſure is the ſame taken at *Paris,* with that which is taken upon a Level by the Sea-ſide. Here he computes upon the fall of the River *Seine*, and judgeth the place where he meaſured to be raiſed above the Sea not more then 80 Toiſes; and concludes the Difference between meaſuring at *Paris* and by the *Sea* not above 8 feet *per* degree. Where he makes a Table of *Levels*; deſcribes an Inſtrument to take Levels with; diſcourſes of Refractions, and how to correct them.

In the *thirteenth* Article he examins ſeveral opinions, different from his, concerning this ſubject; as of *Fernelius*, *Snellius*, and *Riccioli*; and points at the occaſions of their reſpective miſtakes; delivering withal the Differences of their Meaſures from his. Of the three, *Fernelius* comes the nigheſt; which M. *Picart* imputes to meer chance, ſince he uſed not half the exactneſs in obſerving that *Snellius* did. *Snellius* his difference from accurateneſs he attributes, 1. To too ſmall a baſe, he took to meaſure, and to too ſmall triangles, which he was forced to take afterwards: 2. To the want of ſo good Inſtruments, as were employed in theſe Obſervations.

To adde ſomething of the *three Figures*; they repreſent the Connexion of Triangles, by which our Author meaſur'd the Diſtance from *Malvoyſin* to *Sourdon*, and from *Sourdon* to *Amiens*: From which meaſure he concluded, what the juſt length of a *Degree* might be, reduced to the Pariſian Toiſe.

Concerning which Triangles nothing more needs to be added, but only a fuller Explication of what the Letters in them do ſtand for; *viz.*

A. the middle-point at the Mill of *Villejuifve.*

B. the neareſt corner of the Pavillon of *Ivoiſy.*

C. the top of the Steeple of *Brie Compte Robert.*

D. the middle of the Tower of *Montlehery.*

E. the top of the Pavillon of *Malvoyſin.*

F. a pole placed for this purpoſe on the ruins of the Tower of *Montjay*, with a lock of hay put upon it, that it might be ſeen at a greater diſtance.

G. the middle of the Hummock of *Mareuil*, where it was requiſite to have a fire made, to diſtinguiſh it at a diſtance.

H. the middle of the great Oval Pavillon of the Caſtle of *Dammartin.*

I. the Tower of St. *Sampſon* in *Clermont.*

K. the Mill of *Jonquieres* near *Compiegne.*

L. the Tower of *Coyvrel.*

M. a little Tree on the hill of *Boulogne* near *Montdidier.*

N. the Tower of *Sourdon.*

O. a little forked Tree upon the point of the *Griffon* neer *Villeneuve St. George.*

P. the Tower of *Montmartre.*

Q. the Tower near St. *Chriſtopher* at *Senlis.*

Thus we have given you, we hope, ſome ſatisfaction as to this point, at leaſt as to the material parts of it. As to all the particular niceties, (which it would be too tedious to deſcribe) the Book it ſelf, which ſurely ſome time or other will come abroad, may render that ſatisfaction compleat.

Mean time, I would by no means, that this ſhould put a ſtop to the Ingenuity and Induſtry of our Philoſophical Friends here in *England*, or deprive either them of the pleaſure of comparing their exactneſs with that of M. *Picarts*, or the world of the advantage of having ſo important a Problem reſolved by divers Artiſts in different Countries, by different wayes; that ſo, the whole comming to be reflected upon, one may be able to conclude from the accurateneſs of the Obſervers, who they are that are come the neareſt to truth in their Obſervations.

An Extract of the French Journal des Scavans, *concerning a New Invention of Monſieur* Chriſtian Hugens de Zulichem, *of very exact and portative Watches.*

THE Watches of this Invention being made in ſmall, ſhall ſerve for very exact Pocket-watches, and when made greater, ſhall be uſeful every where elſe, and particularly to find the Longitudes both by Sea and Land, foraſmuch as their movement is regulated by a principle of Equality, as that of Pendulum's is Cycloid, and that no kind of carriage ſhall be able to ſtop them.

The ſecret of the Invention conſiſts in a Spiral Spring, faſtned by its innermoſt end to the Axis or Arbre of a poiſed Balance (bigger and heavier then is uſual) which turns upon its pivots; and by its other end to a piece that is faſt to the watch-plate. Which ſpring, when the Ballance-wheel is once ſet a going, alternatly ſhuts and opens its ſpires, and with the ſmal help it hath from the watch-wheels, keeps up the motion of the Ballance-wheel, ſo as that, though it turn more or leſs, the times of its reciprocations are always equal to one another.

In Fig.4. Tab. 1. the upper plate of the Watch is A B: The Circular Ballance-wheel, C D, of which the Arbre is E F: The Spring turned ſpirally, G H M, faſtned to the Arbre of the Ballance-wheel in M, and to the piece that is faſt to the Watch-plate, in G; all the ſpires or windings of the Spring being free without touching any thing. N O P Q is the Cock, in which one of the pivots of the Ballance-wheel turns; R S is one of the indented Wheels of the Watch, having a ballancing motion, which the Ballance-Wheel of rencontre gives to it. And this Wheel R S catches in the pinion T, which holds on the Arbre of the Ballance, of which by this means the motion is entertained as much as is neceſſary.

An Extract of a Letter, lately written to the Publiſher by Dr. *Swammerdam*, of an unuſual Rupture of the Meſentery.

Cum M ad vos iret Cl. Dn C, & quæreret ex me an aliquid literarum per ipſum ad Te curare vellem, nec ſuppeteret aliud ſcribendi argumentum, præſentem caſum rariorem vobis communicare volui.

Figura adjecta repræſentat Convolvulum ſive Affectum Iliacum lethalem, ex ruptura & circumvolutione Meſenterii *inteſtina conſtringentis, ortum.*

* *A A. Inteſtinum Ileum, chylo, flatu & ingeſtis mirum in modum turgens atq; inflammatum.* * V. Tab. 2.

B B. *Meſenterium diruptum, conſtituens vinculum quoddam, inteſtina funeſto fato circumligans.*

C C. *Notatum Vinculum, ex rupto Meſenterio ortum, ac, capreoli ferè in modum, inteſtina nectens.*

D D. *Vinculum illud ſeorſim delineatum, unà cum ejus capreolo, duabus circumductionibus conſtans.*

E E. *Convolvulus inteſtini, ſeu Ilei pars, vinculo fortiter coarctata, ac ſphacelo proxima ; à quo alvus omninò adſtricta fuit, adeò ut tenuium inteſtinorum contenta, vomitu ferè continuo, ſurſùm propulſa fuerint.*

F. *Ilei pars, violentâ illâ at incomprehenſibili trajectione inteſtini per ligamentum* D D *contra naturam extenſa, atq; inteſtinum quoddam cæcum mentiens.*

G. *Ilei extremum, ubi in Colon degenerat.*

H. *Colon modicè contractum, & naturaliter ſe habens.*

L. *Inteſtinum cæcum.*

Hanc obſervationem paucis abhinc diebus, præſentibus D D de Penyn & Dortmont, Noſocomii noſtri Medicis, nec non Clar. viro D. Oort, *habuimus. Vale. Dab. raptim, Amſtelodami, 9 Octob.* 1674.

A Letter of Mr. Martin Liſter, *containing his Obſervations of the* Aſtroites *or* Star-ſtones; *communicated to the Publiſher Jan.* 19. 167$\frac{3}{4}$.

SIR, You are pleaſed to tell me, that my Notes concerning certain Stones figured like Plants, found in the mountains of *Craven*, were well received *. This encourages me to give you the trouble of what I have obſerv'd of the *Aſtroites*; which are ſtones alſo pointed like the other, but not found, that I know of, in the ſame Rocks. And we muſt croſs the plain Country, and ſeek for them hard under the *Yorkſhire* Woolds: For, what ſtore I could procure of them, were brought me from *Bugthorp* and *Leppington*. At the former place, my ſelf have ſeen them dugg out of a certain *blew clay* on the banks of a ſmal rivulet, betwixt the Town and the foot of the Woolds. There are plenty of them waſhed into the brook; but the moſt fair and ſolid are thoſe we get out of the Clay.

* See N. 100. of theſe Tracts.

I pretend not, to diſcover to you their Original, no more than I did of the *Entrochi*; but having uſed ſome diligence in cauſing the places, where they are found, to be a litle more ſearched than

is uſual, I was by that means furniſh't with a good quantity of them; which gave me the opportunity to make the following Obſervations. What light may be hence had, I leave to more judicious perſons, acknowledging my ſelf at preſent not to be able to demonſtrate (if they are not Stones of their own kind,) what they have been before petrification.

It is very litle and inconſiderable, what any Author, that I have yet ſeen, hath ſaid of them; ſave a very brief deſcription of them in *Geſner*, and the like in *Wormius*; in the reſt, all is tranſcribed.

The Matter and ſubſtance of theſe Stones, if broken, is flint-like, of a dark ſhining politure; but much ſofter, and eaſily corroded by an acid *Menſtruum.* Vinegar, indeed, makes them creep; but a ſtronger ſpirit, as of Niter, toſſes them. I doubt not, but they will readily calcine, as the ***Belemnites***, to a very ſtrong and white Lime.

Theſe Stones (as we now find them) are all ***Fragments***; as we have noted of the ***Entrochi***: Either one ſingle joint, or 2, 3, or more joints ſet together, making a pentagonous Cylindrical figure or five-ſided column. And I have not yet had any piece much above one inch long, which conſiſted of 18 joints; but I have ſeen one piece, ſomewhat ſhorter than the former, which had 25 joints. Theſe laſt thin-jointed pieces are quite of a different make, as to all circumſtances, from the other, as will appear.

Every joint conſiſts of 5 Angles, which are *either* drawn out and ſharp, and conſequently the ſides of pieces, made up of ſuch joints, are deep-channeled; (and this is the condition of ſome of the thick-jointed pieces, as well as of all the thin-jointed ones;) *or* the Angles are blunt and round, and the ſides plain or very litle hollowed. There are as big, and as ſmal pieces of this ſort, as of any other more ſharp-angled; and therefore I account them a 3d. ſpecies of *Star-ſtone.* And of this ſort was, I gueſs, that piece which *Wormius* deſcribes; which therefore, he ſaith, is more like the blown Flower of *Pentaphyllum*, than a *Star.* Beſides, the manner of the engraving of the joints in every one of the 3 reſpective ſpecies is alſo very different, as will be declared.

Where the joints are thin or deep, they are *ſo* equally throughout the whole piece; yet are there ſome, but very few, exceptions to this alſo, of pieces which conſiſt of joints of unequal thickneſs.

neſs. Many of the thick-jointed pieces have certain joints a thought broader, or a very litle ſtanding out at the Angles, and thereby the joints are diſtinguiſh't into certain Conjugations of 2, 3, or more joints: And theſe Conjugations are very obſervable in the thin-jointed ſtones, and are marked out with a ſett of Wyers; of which by and by.

The thickeſt piece, which hath yet come to my hands, is not above one inch and a half about, and thoſe very rare too: From which ſize to that of a ſmal pin, I have all the intermediat proporons; and theſe ſo exceeding ſmal pieces are as exactly ſhaped, as the greateſt. Moſt pieces, if not all, of any conſiderable length, are not ſtraight, but viſibly bent and inclining. All the pieces of any ſort are much of an equal thickneſs, or but litle tapering; yet one of the ends, by reaſon of a Top-joint, is viſibly the thickeſt.

This Top joint hath 5 blunt Angles, and is not hatched or engraven, or but very faintly, on the outſide. Every joint elſe of a piece (ſave the top-joint) is an *Intaglia*, and deeply engraven on both ſides alike; and will accordingly ſerve for a Seal. The middle of each angle is hollow, and the edges of the angles are thick furrowed: The terminations of theſe hatchings are the indented ſutures, by which the joints are ſet together; the ridges of one joint being alternately let into the furrows of the other next it. The Hatchings of the flat-ſided pieces are in circular lines; but of the other two ſpecies, they are ſtraight lines, or near the matter.

In the very center of the 5 angles is a ſmal hole, conſpicuous in moſt joints. Note alſo, that in the middle of each joint, betwixt angle and angle; in the very ſuture, is another ſuch like ſmal pinhole very apparent, if the ſtones be firſt well ſcoured.

Beſides all the former particulars, there may be obſerv'd, in the deep-jointed pieces, juſt under the top-joint, above deſcribed, the *Veſtigia* of certain Wyers rather than branches; and ſometimes 2, 3, or more of the joints of the Wyers yet adhering. Theſe Wyers are ever *five* in number, viz. one in the middle or hollow part betwixt angle and angle. Again, in *thin*-jointed pieces there are ever *five* of theſe Wyers, or a *ſett* of them inſerted into every conjugation of joints; ſo that it were ſome repreſentation of the thing, to imagine the ſtalk of *Aſperula* or *Equiſetum*. Alſo I have ſeen, but that very rarely, (not in one piece amongſt 500,) a ſett of

Wyers in the middle of a *deep*-jointed piece. One thin-jointed piece I have by me, where a Wyer of 20 joints and upwards (and how much longer they may be, I know not,) lyes double within the hollow ſide, and by that accident was preſerved in its natural place. Further, ſome lumps of Quarry I have from the ſame place above-nam'd, where the Wyers as well as the Stones themſelves are ſeen in long pieces. It is no wonder, that theſe Wyers are knocked off, and but very rarely found adhering to the Stones they belong to, being very ſmall and ſlender, of a round figure and ſmooth-jointed, being ſett together *per harmoniam* and not indented ſuture. Nothing that I can think of, is ſo like theſe Wyers, as the *antennæ* of Lobſters. Laſtly, ſome of theſe Wyers are knotted, and others of them fairly ſubdivided or branched.

I have, by the aſſiſtance of Mr. *Lodge*, illuſtrated all theſe particulars with *Figures*: Of which this is the Explication; *

* See Tab. 2.

1. The Top-joint of an *Aſtroites*, figur'd on both ſides; on the one it is deep engraven, on the other the hatches are ſcarce viſible. Alſo the ends of the 5 Angles are very blunt.

2. A ſecond or ſharp-angled joint with fair hatchings on both ſides.

3. A piece with very narrow and ſharp angles. Alſo the Top-joint deſigned, as it naturally appears ſmooth and without hatchings.

4. A round-angled joint.

5. A flat-ſided piece; where the hatchings are ſomewhat Circular.

6. A thin-jointed piece: Where note alſo, that the angles are much narrower, and of a protracted Oval figure.

7. The biggeſt piece I have yet ſeen. Note alſo its bending.

8. The ſmalleſt piece I have yet met with.

9. The longeſt piece; where every 4th joint is a thought bigger or more prominent than the reſt; as in the 7th fig. alſo is well deſigned.

10. A large and round-angled or flat-ſided piece; to which belongs that ſingle joint noted fig. 4.

11. A flat or not hollow-ſided piece; of which ſort alſo is the 5th figure: The 10th and 4th not much differing.

12. A thin-jointed piece; where the conjugations are marked

out by the *veſtigia* of the ſeveral ſets of Wyers or branches.

13. A piece where the joints are un-equal in thickneſs.

14. A piece with ſome part of the Wyers yet adhering in their natural order at the biggeſt end of the piece.

15. A thin-jointed piece; where note on the left ſide a ſingle Wyer accidentally preſerved in its natural place, though ſnapt aſunder.

16. A thick-jointed piece with a ſet of Wyers in the middle of it.

17. A good long piece of a Wyer, and a ſingle joint thereof.

So far Mr. Liſter: To which we cannot but add Mr. *Rays* Notes upon theſe very Obſervations.

I was much taken, (*ſaith he* to Mr. *Liſter*) with your Obſervations concerning the Star-ſtones, and inform'd in ſeveral particulars. For, although I had often ſeen, and my ſelf alſo ſometimes gather'd of thoſe bodies; yet I did never curiouſly note the texture, parts and differences of them. As for their *Original*, if you can allow the *Trochites* and *Entrochi* to have been fragments of Rock-plants, I ſee not, why you ſhould make any difficulty of admitting theſe to have been ſo too; the ſeveral *internodia* being alike thin in both, and the Commiſſures not much different; only the external figure doth not correſpond. But it is to be conſidered, that many of the *Trochites* have a pentagonous hole in the middle of them, which if we admit for the receptacle of the pith, it will be as hard to exemplifie ſuch a figur'd pith, as ſuch a figur'd ſtalk in Land-plants. Your note concerning the Wyers ſpringing out of the furrows or concave angles of ſome of the *internodia*, and encircling the ſtalk like the leaves of *aſperula* or *equiſetum*, was ſurpriſing; and ſeems to me to argue theſe bodies to belong to the *genus* of Vegetables; no leſs than Coral, Coralline, and the ſeveral ſorts of *Pori*; ſome of which are alſo jointed: But no vegetable, either of Land or Sea, that I know of, hath ſuch frequent joints and ſhort or thin *internodia*; and ſo they are things of their own kind, whoſe *ſpecies* is, for ought we know, loſt. If they were Vegetables, I gueſs they were never ſoft; but grew upon the rocks like Coral, and the other Stone-plants, juſt now mention'd; hard as they are.

As for *Equiſetum*, we know, that the Leaves of ſome ſorts of it are jointed, as well as the Stalk: Elſe I know no plant that hath jointed leaves; except ſome ſorts of *Ruſh-graſs*; though thoſe briſtles of *equiſetum* ſurrounding the ſtalk, neither theſe reputed leaves of *Ruſh-graſs*, can properly be call'd Leaves, being round, and having no difference of upper and lower ſuperficies. Now that I have upon this occaſion mention'd *equiſetum*, give me leave to mind you of what I have already publiſh'd to the world; That I have found, on the banks of the river *Tanar* in *Piedmont*, plenty of the fragments of the ſtalks of *equiſetum* perfectly petrified, with litle or no increaſe of bulk, ſo exactly like the plant, that all the *ſtriæ* did all along clearly appear. The colour of theſe petrified ſtalks was white.

An Accompt of two Books:

I. *Les dix Livres d' Architecture de VITRUVE, corrigez, & traduits nouvellement en Francois, avec des Notes & des Figures; par* Claude Perrault, *de l' Academie Royale des Sciences, & Medecin dela Faculté de* Paris. *Imprimé à* Paris, 1673. *in fol.*

THE Ingenious and Learned Author of this Verſion of *Vitruvius*, and of the Notes upon him, conſidering with himſelf, that one of the Obſtacles to the advancement of Architecture was the want of being able to draw the Precepts of that Art out of its true and genuine ſource, by reaſon of the great obſcurity of *Vitruvius*, who is the only Writer of the Antients that we have upon this ſubject; did undertake, by a Tranſlation into the French tongue, and by Notes upon the difficult places, and alſo by illuſtrating all with Figures, to render this Author more clear and uſeful to thoſe, that embrace the profeſſion and practice of that Noble Art.

This Interpreter found, that in effect moſt of the matters contained in *Vitruvius* being ſo little underſtood as they are, had need of an Explication more clear and more exact than the Text we have remaining; foraſmuch as the Author did not, in his opinion, ſo much endeavour to make it clear as ſuccinct, in the confidence he had that the *Figures*, added by him would ſufficiently explain the matter, and thereby ſupply what ſeems to be wanting in the Diſcourſe.

Theſe *Figures*, ſaith M. *Perrault*, were loſt by the negligence of the firſt Tranſcribers, that could not deſign, and that probably alſo did not judge them altogether ſo neceſſary; becauſe the contemplation of thoſe Figures having inſtructed them of the things themſelves ſpoken of in the Text, it ſeem'd to them intelligible enough; in like manner as it commonly happens, that we do well enough underſtand what is ſaid, though obſcurely, when the things are clear themſelves. And thus it could hardly be avoided, but that thoſe who afterwards made Copies of thoſe Exemplars that were deſtitute of Figures, would commit many faults, tranſcribing things which they underſtood nothing of. Nor is it to be wondred, that even now the moſt perſpicacious Readers of this Author, who not only want the Figures, but in a manner the Text it ſelf, meet with ſo much difficulty in finding good ſenſe in very many places, in which the change or tranſpoſition of a word, or only of a point, hath been able utterly to ſpoil the Diſcourſe, which was the more liable to an almoſt irreparable corruption, becauſe the matter of it was more diſpos'd for it than any other.

Now concerning the difficulty that is met with in the Tranſlation of this *Vitruvius*, that proceeds, in our Interpreters Judgment, from hence, that 'tis not eaſie to find in one and the ſame perſon the ſeveral different abilities requiſite to ſucceed therein: Foraſmuch as the skill of good Literature, and the diligent application to the ſtudy of Criticiſme, and the inquiry into the ſignification of Terms of Art, that are with great judgement to be collected out of many ancient Authors, are ſeldom joyned with that *genius*, which in Architecture, as well as in all other noble Arts, is ſomewhat like to that different inſtinct, which Nature alone infuſes to every Animal, and which makes them ſucceed in certain things with a facility, that is denied to thoſe, who are not born for it.

Hence it is, *ſaith our Interpreter*; that thoſe who ſince 160 years have laboured in the Traduction of this Author, (among whom the chief are, *J. Jocondus*, *Cæſar Ciſaranus*, *J. Bapt. Caporali*, *Guil. Philander*, *Daniel Barbaro*, *Bernardinus Baldus*, *J. Martin* Secretary to the Cardinal *de Lenoncour*, and *J. Goujon* Architect of *Francis* I. and *Henry* II. Kings in *France*,) have not given ſatisfaction. And for the ſame reaſon, (he is pleaſed to adde,) there may be cauſe to believe, that this new Verſion may not produce a much better effect, and that the addition of that little light to what ſo many great men have to little purpoſe hitherto endeavoured to give to *Vitruvius*, may be of little moment in reſpect of the many difficulties that remain: Yet he diſpairs not but that it may be of ſome uſe, even to thoſe that are Maſters of the Latin Tongue; and that many, that might be able to underſtand all that is here explain'd if they applyed their minds to it as he, (the Interpreter) hath done, will be very glad not to be obliged to give themſelves that trouble. As for thoſe, that are not skilled in Latin nor Greek, (who are thoſe for whom chiefly this Verſion is made,) the Interpreter is of opinion, that they will find in it a facility not to be met with in the former Verſions, in which moſt of the Tranſlators have not taken the pains of explaining the *phraſes* nor the difficult words, but only turn'd them into the terminations of their language; others have put into the very Text the explication of the words, which makes it doubtful, whether theſe interpretations belong to the Text, or whether the Tranſlatour have added them. But this Interpreter hath put this kind of explications in the Margin, where are alſo found the Greek and Latin words, that could be rendred by French words in the Text. Mean while, he hath been conſtrain'd ſometimes to retain the Latin and Greek words in the Text, when they could not be made French but by long circumlocutions; which yet are explain'd in the Margin periphraſtically. But the main thing obſerv'd in this Tranſlation, are the Notes, giving the explication judged neceſſary for underſtanding the Text, which the bare and literal ſignification of the words that are in the margent would not ſufficiently make out. Great care ſeems to have been uſed to change nothing in the Text, nor even in thoſe things that make the reading of it not ſo pleaſing, and that are not of any uſe for underſtanding the matter treated of. Mean time the Interpreter hath not ſcrupled to expreſs the *genius* of the Latin Tongue in the true *genius* of the French, yet with a careful endeavour faithfully to deliver the Author's ſenſe, though not alwayes word for word; which latter yet he is ſollicitous to do, when the obſcurity of the matter obliges him to it, leaving it to the ſagacious Reader to diſcover the ſenſe, or to ſupply it by changing ſomewhat or other. Often he propoſes his conjectures upon ſuch paſſages that are manifeſtly corrupted; which yet he doth ſo, as he never puts into the Verſion the corrections, which his conjectures cauſed him to make, without giving advertiſement thereof in his Notes. His Corrections are many, he not thinking that an injury to the good opinion men are to entertain of the ability of ſo great a man as *Vitruvius*, ſince, without being poſitive, our Interpreter only *propoſes* the doubts he hath of the Authors miſtaking ſometimes; it not being to be expected, that he who undertakes to explain an Author ſhould be bound to make his Panegyrick, nor maintain all he hath written.

In ſhort, the importance of our Interpreters Notes conſiſts in theſe two things: Either they explain paſſages only remarquable for their obſcurity, and for the trouble which Learn'd men have taken to clear them; or they are about other things likewiſe obſcure and difficult, but ſuch as contain precepts neceſſary and uſeful to Architecture.

The Figures, which ſerve for illuſtration, are done with no ordinary care and elegancy; amongſt which there are, the Repreſentation of the Pariſian Obſervatory, erected by that King for making Celeſtial and other Natural Obſervations; Models of two new Engines for raiſing heavy burthens, ſo contriv'd as to avoid Rubbing, invented by the Interpreter himſelf; the one by a Roler, the other by a Lever, *p.* 280. 324. An Engin for raiſing water very high and unceſſantly, and that in great quantity, without employing any external force; A Scheme of the Organ of the Antients; as alſo of their *Catapultæ*, and *Baliſtæ*, the former caſting Javelots, the latter Stones. All Three deſcribed by this Interpreter with much learning. The *Models* of theſe Engins and many more, both Antient and Modern, Monſieur *Perraut* ſaith are to be found in the Royal Library at *Paris*, where thoſe of the Philoſophical French Academy keep their ordinary Aſſemblies.

II. Anthonii le Grand *Diſſertatio de Carentia Senſûs & Cognitionis in BRUTIS*: Londini, *apud* Joh. Martyn, *R. Soc. Typographum*, *ad Inſigne Campanæ in Cæmeterio D.* Pauli, 1671.

THE Author of this Tract having conſider'd with himſelf, what it is that hath induc'd men to believe, that Brutes have knowledge; which inducements he aſcribes to the induſtry, vivacity, and ſtrange works of ſundry of them: And having exploded the *Ariſtotelian* definition of the *Soul*, as extravagant, and unintelligible; and examin'd the opinions of *Gaſſendi* and *Honorato Fabri* of the nature of the ſame; he doth, at length, conſonantly to the *Carteſian* principle, place the Life of Animals in the continued motion of the Blood. And then having explain'd, wherein the nature of *Knowledge* properly conſiſts, and ſhew'd, that all true knowledge includes Conſcience, he comes to the reſult, That the Soul of Brutes, whatever it be fancied to be, is deſtitute of knowledge, ſtrictly ſo call'd; and that Matter is incapable of perception; as alſo that Cogitation cannot be truly affirm'd of Extenſion, neither as an Eſſential part, nor as a propriety, nor as a mode thereof: Refuting Mr. *Hobbes*, that undertakes to maintain, Cogitation to be a corporeal motion; and likewiſe ſhewing againſt *Gaſſendi*, that 'tis repugnant, Senſe ſhould ariſe from unſenſible things.

This done, he ſhews, that God can make Engins that ſhall imitate the actions of Brutes; where he compares a living Dogg with an *Automatum*, made by Art; and withal diſcovers the error of thoſe, who from the external form of the parts in Brutes judge them to have knowledge like Men; ſhewing at the ſame time the difference between Man and Brutes; which he places chiefly in two particulars: One is, that Brutes are not endow'd with the faculty of ſpeaking, ſo as by ſigns to manifeſt their thoughts, and to anſwer appoſitly to ſuch things as are asked of them. The other is, that, though the motions of ſuch Engins be regulated, and exceed, in certainty, the motions even of the wiſeſt men; yet they come ſhort of Man, in many of thoſe things in which they ſhould imitate him moſt.

Here our Author enlarges his diſcourſe by repreſenting, *that* all Motions in Brutes may be explain'd by a Mechanical principle; *that* by a meer mechanical operation the Blood is carried about the whole body; *that*, as the Life of an Animal, ſo the Concoction of the food dependeth only from a corporeal principle, as alſo Sanguification, Nutrition, Reſpiration; and *that* Muſcular motion is made by means of the Animal ſpirits; the force of which he explains; and alſo, from whence they have that great power, whereby they move the whole body.

Having diſpatch't ſo far, he endeavors to make it out, from whence that great diverſity of motions ariſeth in Animals, if they have no Soul: where he proveth, that even in *Man* there are many motions, made without the advertency of the Soul, and ſometimes even againſt the will of the Soul.

Then he proceeds to teach, How *Senſe* may be aſcribed to Brutes; but yet adds, that Senſe conſiſts not in the motion of Corporeal organs, but in Perception; and that corporeal motion may be had without Senſe; and that thoſe do greatly miſtake, who from outward actions conclude, that Brutes do *ſentire*, as we do. Where he diſcuſſes Dr. *Willis*'s opinion concerning the Soul and Knowledge of Brutes.

Having thus diſcourſed, that Brutes are deſtitute of Senſe and Perception, and that no knowledge at all is to be found in their operations, and conſequently that the well-contrived ſtructure of the parts, and the exact direction of the Animal ſpirits through certain and determinat paſſages, may and muſt perform all their actions; He deſcends to particulars, and labors to make it manifeſt, that all the Actions of Animals may be explain'd mechanically. Where he ſhews, how *Bees* make their cells ſo elegantly; whence comes the diverſity of actions in Brutes; their kindneſs and averſion; their generation; their care of themſelves; their ſeeming doubtfulneſs, craft, (eſpecially that in Foxes,) docilneſs in Doggs, Elephants, &c. their underſtanding of human ſpeech, and ſeeming faculty of ſpeaking to one another, &c. Where many things occurr that ſeem to deſerve our conſideration.

ERRATA.

Pag. 269. l. 17. r. *above* for, *above* 3. p. 273. l. 22. del. *of rencontre.*

LONDON,
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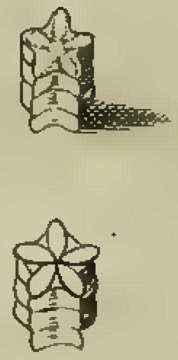

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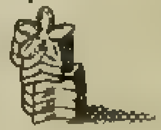

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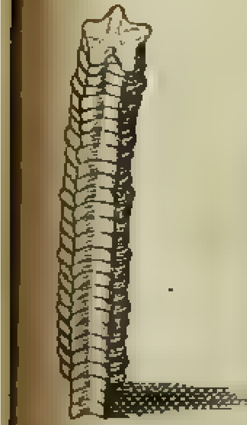

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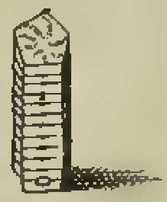

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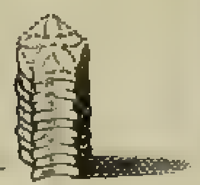

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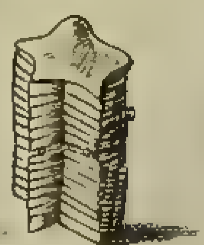

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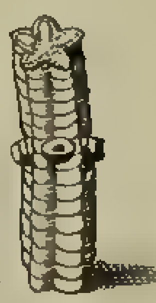

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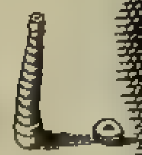

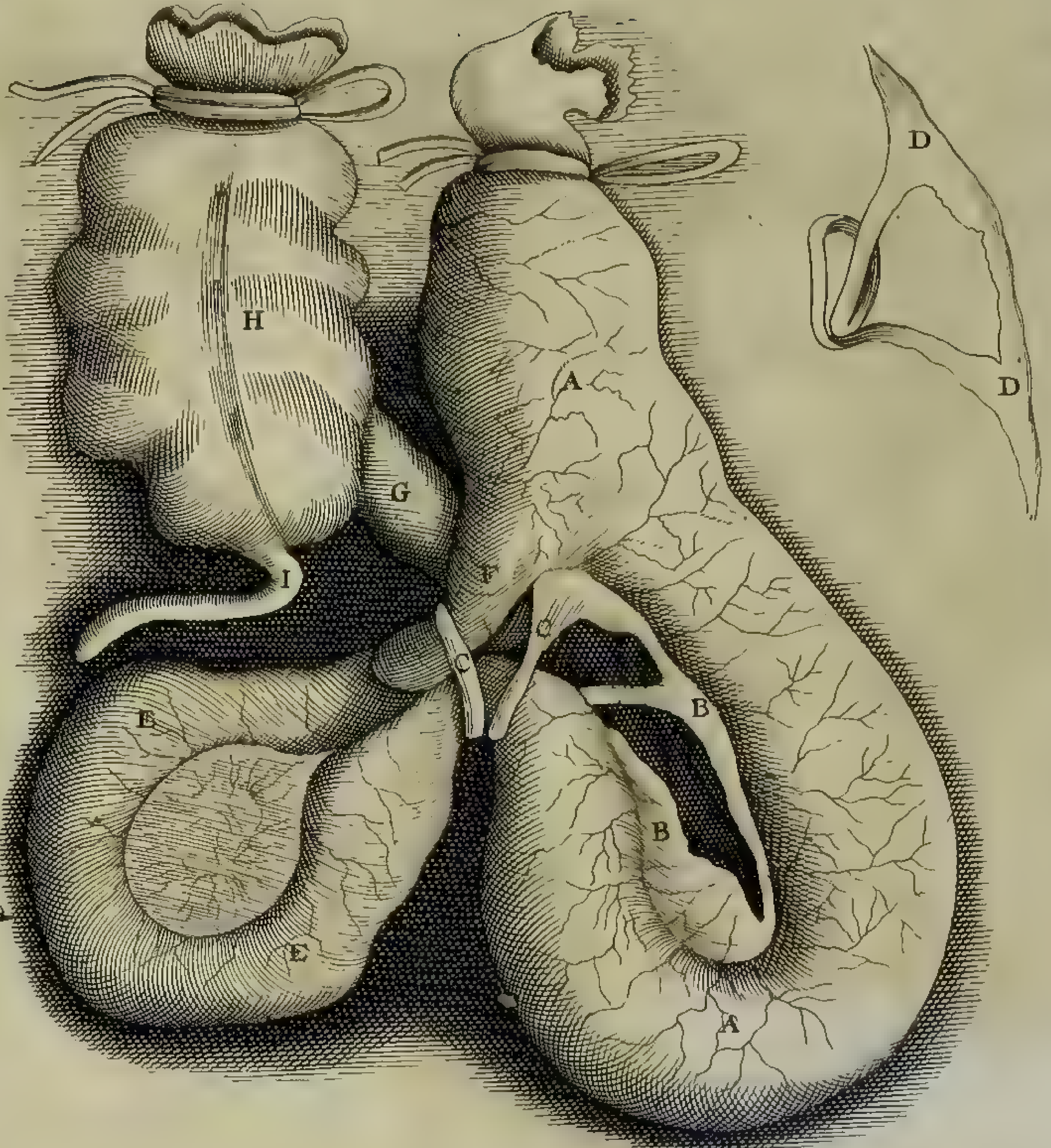

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Fig. 1.

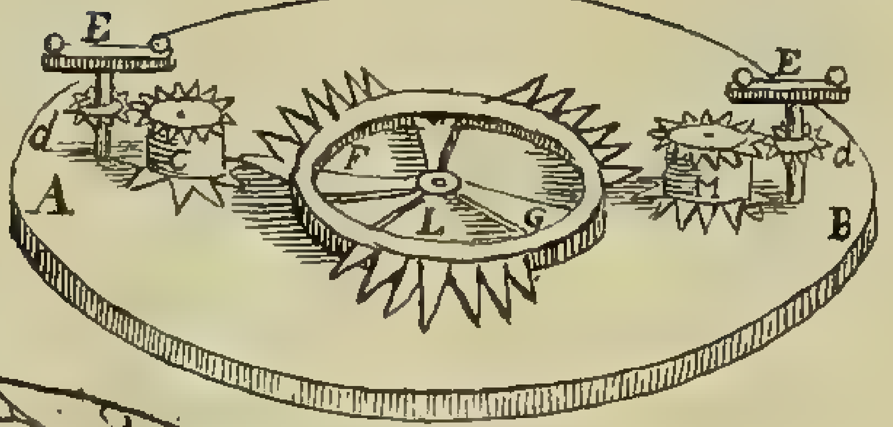
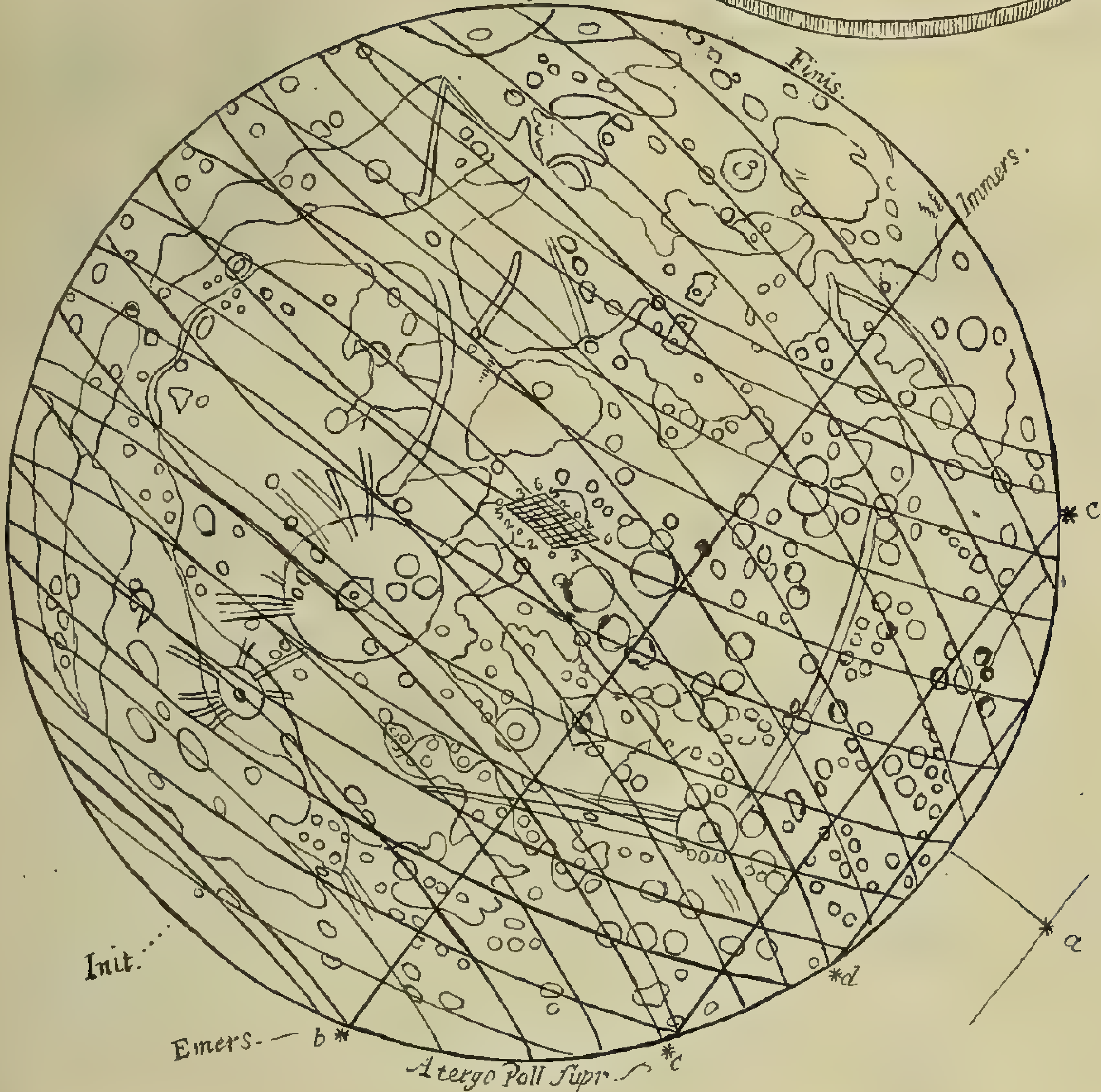


Fig 2



PHILOSOPHICAL TRANSACTIONS.

April 26. 1675.

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An Extract of a Letter of the Learned Dr. Gothofredus Guil. Leibnitz, *concerning the Principle of exactneſs in the portable Watches of his invention.*

THE Principle I thought upon ſome years ago for making exact portable Watches, is altogether different from that which conſiſts in an Equal duration of Unequal vibrations of pendulums or Springs, applyed to Watches by M. *Hugens* with ſo general an applauſe; this depending upon a Phyſical Obſervation; but mine being grounded upon a meer Mechanical reflexion, which is eaſie enough, and whereof the reaſon and demonſtration it ſelf is manifeſt to our ſenſes, which hath not been taken notice of, for want of the Art of Combination, the uſe of which is far more general than that of *Algebra*. For having conſider'd with my ſelf, that a Spring being bent to the ſame degree, will always unbend it ſelf in the ſame time, provided it find the ſame freedom of unbending it ſelf ſuddenly; I inferred from thence, that there might be employ'd two ſuch, one of which ſhould play, whilſt the firſt

Mover of the Watch did bend the other again; ſince it will be no matter in this way, whether it bend again more or leſs ſpeedily, ſo it bend only again before the other have done unbending it ſelf; and conſequently, the one delivering the other at the end of its motion, this play will always continue uniform, and ſo by letting go, at every turn or period of theſe two Springs, a tooth of a wheel carried about by the ordinary motion, which counts ſeconds or other parts of time, equal to the periods, we ſhall have ſuch a Watch as is deſired by us.

Theſe thoughts of mine I have executed in the following manner ||: Let AB be one of the Watch-plates; C and M. two indented barrels, wherein the ſmall Springs are incloſed. The teeth of the barrels catch thoſe of the pignons d,d. which carry the ballances e, e; and other teeth of the ſaid barrels are catch't by thoſe of the interrupted wheel F G. Now let us imagine, that this wheel FG, being moved towards HF by the force of the firſt Mover of the Watch, and turning the barrel C, bends the Spring incloſed in it, and ſtops with the barrel as ſoon as it hath bent this Spring. This piece which ſerves to ſtop, is eaſie, and hath not been thought neceſſary to be marked here, to avoid embaraſſing the Figure. But whilſt one indented part of the interrupted Wheel F G, *viz.* F. turns the barrel C, the empty part, oppoſed thereunto, which is G, anſwers to the other barrel M, and gives liberty to the Spring, it incloſeth, to unbend it ſelf. Thus whilſt the movement of the Watch bends the ſmall Spring of the barrel C, in the ſame time the ſmall Spring of the other barrel M, unbends of it ſelf. I ſay, *in the ſame time*, except the Spring C ſhall have done bending a little ſooner, than the Spring M ſhall have unbent it ſelf: So that the Spring C. being bent, and the Wheel FG ſtopped; both of them ſtay in this poſture, till the Spring M, when it ſhall be quite unbent, do, at the end of its motion, touch a piece which delivers it. And then the Spring C unbends of it ſelf in its turn; the teeth of the interrupted Wheel, which continues its motion the ſame way as before, ſince 'ti deliver'd, not being any more able to hinder it therefrom, becauſe the barrel C doth now meet with the empty part H of the ſaid Wheel. But before it hath done unbending it ſelf, the indented part I., being oppoſite to the empty part H, that turns the barrel M, bends its Spring again, and having done ſo, ſtopps with it, whilſt the Spring C, making an end of unbending it ſelf, delivers

|| See Fig. I.

delivers them by a reciprocal good office, and renders to the Spring M the ſame ſervices, which it had received from it, with an expectation of receiving the like again.

Which being well conſider'd, 'tis manifeſt, *that* the ſame alternative Motions will continue always: *that* the periods taken from the very moment that one Spring begins to unbend, until the moment it once unbends it ſelf again, will always be of equal duration, though the two ſmall Springs be not equally ſtrong: *that* the Ballance of ſuch a Watch will be double, and be charged more or leſs, and receive delay, by advancing or recoiling, along the two arms, two equal weights, counter-balancing one another, that ſo the change of the ſcituation may not at all prejudice the Equality of the Watch. For the reſt, we may in this kind of Watches ſpare the fuſee, and conſequently the ſtring or chain. 'Tis alſo eaſie to judge, *that* ſuch Watches as theſe may be of a ſize ſufficiently ſmall; *that* they will make no more noiſe then ordinary Watches; *that* they will be as exact as pendulums, and ceaſe not to go whilſt they are winding up. And though the motion of the Watch-wheels may be alter'd by many accidents, ſuch as are, the inequality of the motion of the great ordinary Spring, I mean, the firſt Mover; the more or leſs rubbing of the wheels according as the oyl grows thinner or thicker; the ruſt, the verdigreaſe, the play of the pieces, the inequality of the teeth, and the like; yet the periods of the ſmall Springs will not be concern'd in all or any of them, provided the motion of the Watch-wheels have always more ſtrength than it needs to bend them again; which is in our power. And ſo the Principle of Equality here is ſure by a kind of demonſtration altogether Geometrical, and withal very evident even to ordinary capacities.

It remains to touch in a few words the objections that have been made againſt this contrivance by ſome intelligent perſons. They have all acknowledged, that this would be a perfectly exact Watch for common uſe, but if employed for finding the Longitudes, there would occurr theſe difficulties, viz. *That* toſſing of Ships would ſhake the Springs as well as other pieces; *that* ruſt would ſpoil them, ſince the ſaltiſh humidity of the Sea in remote voyages ſpares not the veey needles of Compaſſes though incloſed in boxes; *that* the changes of ſeaſons and climats will ſenſibly alter the Springs, eſpecially the great heats, or rains within the Tropiques, which at length will ſomewhat untemper the Steel; as is confirmed by the Experiments of the Illuſtrious Academy of *Florence*, ſhowing, how eaſily that Heat and Cold do change ſlender Springs: Beſides, that the Air more or leſs condenſed will alſo more or leſs reſiſt the motion of the ballance. To which may be added, that Springs by working are weakned; and laſtly, that there will be always ſome little friction, that will make the ſeveral pieces go more or leſs eaſily, and that even in length of time they will wear out.

But I anſwer, that all theſe defects, that proceed from the imperfection of the matter, may be ſurmounted by a general remedy, without examining them here in particular. And that is, that for executing it in great, we may make uſe of maſſy Springs, as are thoſe of Croſs-bowes, we being Maſters of them, not wanting force or place in a Ship to govern a great weight that may ſerve to bend them continually again. Now theſe maſſy Springs may be ſo great, and their reſtitution ſo ſpeedy by augmenting their number, that all the above-named defects will have no conſiderable proportion to this ſtrength, and the aggregate of their repetitions will not be ſenſible till after a very long time. And 'tis eaſie to demonſtrate, that by augmenting the bigneſs of the Engin, and the force of the maſſy Springs, we may make the error as ſmall as we will, provided we paſs not the bounds of conveniency, and content our ſelves with an exactneſs ſufficient for the end, they are principally deſigned for, which is the finding of the Longitudes: Which anſwer is ſo clear and ſo univerſal, that all thoſe that have conſidered it, have expreſſed their ſatisfaction therein.

Obſervatio Eclipſeos Lunæ totalis cum Occultationibus quarundam Fixarum, habita à *Joh. Hevelio* Anno 1675. die ♀, 11 Januarii St. n. Veſp.

Vid. Fig. 2.

QVò rariùs nobis Eclipſes Lunares *totales cum morâ hîc Gedani hactenus in conſpectum venerunt, eò exactius hanc obſervare ab omni parte allaboravimus; præprimis cùm cœlum admodùm ſudum extiterit, ut omnia quæcunq; volueram, non ſolùm initium* Eclipſeos, *cum immerſione, emerſione, & ipſo fine, ſed etiam plurimas phaſes, cum aliis quibuſdam rariſſimis phænomenis, occultationes videlicet nonnullarum* Fixarum, *& quidem ipſo tempore maximæ obſcurationis, ex voto deprehendere & annotare licuerit. Quæ cùm raró admodùm ſimul eveniant, atq; ad reſtaurandum motum* Lunarem, *Calculumq;* Eclipſium *plurimùm faciant, haud ingratum fore putem, tam Illuſtriſſimæ Regiæ Noſtræ Societati, quàm reliquis Aſtroſophis omnibus, Res Aſtronomicas attentiori animo excolentibus, ſi hujus* Eclipſeos *obſervationem, cum omnibus phaſibus, diligenter & exquiſitè determinatis, nunc quoq; exhibeam. Videbitis ex ipſâ obſervatione & Delineatione (abſit jactantia) me ad omnia, quæ circa* Eclipſes *aliàs notari meritò debent, ſatis ſcrupuloſè attendiſſe; præſertim verò vigilantes oculos per totam* Eclipſeos *durationem tubo viginti pedum, aliiſq; præſtantioribus, ad quatuor illas fixas (neglectis cæteris minoribus, quas optimè etiam conſpiciebam) inter quas* Luna *eo tempore verſabatur, direxi. Ab* a *Stellula vix* 4 *Minutis limbo ſuo inferiori in* ☌ *diſtabat; tres verò reliquas, utpote* b, c *&* d, *Luna corpore ſuo omninò texit; prout ex delineatione & Obſervatione liquidum eſt. Ex omnibus autem his quatuor inſignioribus ſtellulis, non niſi unica* c *ab Aſtronomis hactenus obſervata, Globiſq; adſcripta eſt; nominatur informium inter* ♊ *&* ♋ *Suprema à tergo* Pollucis; *cujus curſus cum ingreſſu, viâ itinerariâ, atq; egreſſu inprimis, donec pariter reliquarum fixarum loca ritè deſignata habeas, probè notandus. Quippe ex hujus generis obſervationibus, quando videlicet loca ſtellarum correctè reſtituta ſunt, multò procliviùs datur motum* Lunæ *redintegrare, ejusq; Nodos Latitudinemq; reſtaurare, quàm, meo quali quali judicio, ex nudis ſolis* Eclipſibus. Lunæ *enim motus, tum* Eclipſes *ſecundùm Tabulas univerſas, (ut omnes Aſtronomi plus quàm abundè habent expertum,) ſæpiùs à veritate & ipſo cœlo ſatis evidenter deflectunt; quemadmodùm etiam in hâc* Eclipſi *totali, aliiſq; plurimis contigit.* Etiam *ipſe calculus* Kepleri *in univerſum haud parùm, ut mox clariùs percipietur, ab Obſervatione hujus* Eclipſeos *aberravit. Non ſolùm Initium ad* 12′ 28″, *atq; immerſio totalis* 8′ 40″ *citiùs ingruerunt, ſed Emerſio quoq;* 31′

6″,

6", & Finis 20' 42" citiùs inciderunt; adeò ut totalis obſcuratio non niſi Hor. 1 29' 46", tum tota Eclipſis, ab initio ad finem uſq;, tantùm Hor. 3 38' 10" duraverit; cùm tamen illa 22' 26", hæc verò 6 14" longius, juxta nempe calculum Rudolphinum, durare debuiſſet. Siquidem calculus hicce exhibet hic Gedani

	h.					
Initium Eclipſ.	6	54'	18"	*Latitud.*	1'	10"
Immerſionem totalem	7	51	24			
Emerſionem ex umbra	9	43	36			
Finem	10	40	42	*Latitud.*	12	55
Totam moram	1	52	12			
Totam durationem	3	46	24.			

Ex quibus evidentiſſimè liquet, calculum ab omni parte ſatis adhuc à Veritatis norma diſcedere. Habebimus itaq; quæ in poſterum agamus, quæq; in Aſtronomia reſtituamus. Sed ut ad Stellas illas Fixas redeamus: Stellula b *ad Montem Eoum circiter tecta eſt, &* d *ad ipſum limbum Lunæ inferiorem; illa per Sinum Sirbonis, I. Rhodum, & S. Athenienſem; hæc verò per deſertum Mingui tranſit; uti ex viâ itineraria utriuſq; ſtellæ patet. At ſtella* c, *Suprema ſcilicet à tergo Pollucis, ad Lacum Meridionalem Lunam ſubiit, & rurſus ſub Monte Nevoſo exiit. Ingreſſus horâ 8.35'.20", in maximâ ferè obſcuratione contigit; egreſſus verò horâ 9. 9'.10", antequam adhuc Luna lumen recuperabat; ſic ut per 33' 50" temporis dicta ſtella ſub Lunâ dilituerit, ejuſq; linea itineraria ad 3'20" à limbo Lunæ inferiori centrum verſus inceſſerit. Cùm tamen, (quod maximè notandum,) neq; ratione Longitudinis Lunæ, vel ſtellæ, neq; Latitudinis, ſecundùm ſcilicet Calculum* Rudolphinum, *locumq; ſtellæ à* Keplero *vel* Ricciolo *determinatum, eam ipſam ſtellam Luna occultare potuerit: ſicut ex calculo, ſi eum debitè inieris, luculenter deprehendes. Idcircò neceſſarium eſt, aut in loco Fixæ, aut in motu Lunæ, ejuſq; Nodis ac Latitudine errorem latere. Verùm Fixa, credas velim (cum ejus locum, ut & reliquarum trium, jam rectè reſtitutum habeam, prout ſuo loco patebit) in tantum non deviat ut hocce phænomenon omnimodè ſalvari poſſit. Quamobrem alia cauſa huic rei ſubeſt, atq; in Lunâ, ſine omni dubio, iſte defectus calculi quærendus; quò hæcce occultatio, tum exhibita* Eclipſis, *aliæq; plurimæ, ab omni parte penitùs ſalventur, calculuſq; ad rectum tramitem deducatur. Quod ut ſuo tempore Aſtrorum Scrutatoribus feliciſſimè ſuccedat, atq; divina Sideralis noſtra Scientia à mendis omnimodò tandem depurgetur, faxit Deus Optimus Maximus.*

Eclipſis Lunæ totalis, cum Occultationibus quarundam Fixarum, obſervata *GEDANI* Anno 1675, die ♀, 11. Januarii ſt.n. veſp. à *Joh. Hevelio.*

Temp. ſecund. horol. Oſcillat. ex altitudinibus Correct.	*Ordo Phaſum.*	*Altitudines Fixarum. Nec non animadverſiones quædam notatu dignæ.*	*Per quas Maculas tranſiverint Umbræ Sectiones.*
H. ′ ″		° ′ ″	
6 22 18		*Altitudo Caudæ Cygni* 39 3 0	*Phaſes Creſcentes.*
6 25 4		*Eadem Altitudo* 38 41 0	
6 35 0		*Penumbram Luna ſubiit*	
6 41 50		*Initium Eclipſeos*	*Incepit circa* 50°. *à puncto Nadir ortum verſus.*
6 43 45	1.	*Paludem Maræotidem attigit*	*Tempore initii, Sinus Sigaricus, Inſ. Besbica & Inſ. Melos in linea recta extiterunt.*
6 44 55	2.	*Palus Maræotis omninò obſcur.*	
6 49 0	3.		*Sect. umbræ per M. Pentadactylum & Eoum tranſiit.*
6 52 30	4.	*Mons Porphyrites tectus*	*Per loca Paludoſa Montemque Cataracti.*
6 57 35	5.		*Ad M. Baronium, per M. Petri, Athor, & M. Troicum.*
7 2 15	6.	*M. Ætnam tegere incepit*	*Ad Sin Apolinis, Inſ. Ficariam, ad radices Montis Ætnæ, Inſ. Didymæ, Lacumque Meridionalem.*
7 2 55	7.	*M. Ætna omninò tectus*	*Ad Inſ. Sardiniam, per Inſ. Hieram, Inſulamque Cretam.*
7 7 40	8.		*Per M. Atlanticos majores, Inſ. Vulcaniam, Rhodum, Montemque Annæ.*
7 10 40	9.	*M. Sinai tectus*	*Per I. Ophiuſam, I. Cyprum & M. Sinai.*
7 14 0	10.	*Lacus niger major tectus*	*Ad L. nigrum majorem per M. Sipylum, Libanum Montemque Seir.*
7 16 40	11.		*Per L. nigr, Minorem, I. Besbicam, M. Olympum & Didymum.*
7 20 20	12.	*Fixa* c, *ſuprema nempe à tergo Pollucis diſtitit à limbo* ☽ *ortum verſus* 30°. *ferè*	*Sectio umbræ tranſiit per M. Carphatos, Byzantium & Taurum.*
7 25 0	13.		*Per Lacum Boryſthenem, I. Apolloniam, M. Moſchum & Sogdianos.*
7 28 30	14.		*Per Montes Macrocemnios, Promont. Arietis, Herculeum per Sinum extremum Ponti, Montemq; Parapæmiſum.*
7 32 0	15.		*Per Paludes Hyperboreos, I. Corocondametis, Montemque Caucaſum.*
7 34 10	16.		*Per Montes Riphæos, Palud. Mæotidem, Sinum inferiorem Maris Caſpii.*
7 42 44		*Totalis immerſio contigit circa* 50° *limbi à puncto Zenith, occaſum verſ.*	
7 55 30		*Stellula* a *in ipſa* ☌ *cū* ☽; *Diſtitit à limbo ejus inferiori* 4 *circit. minut.*	
8 0 50		*Stellula* b *ad M. Eoum tecta.*	

Temp.

Temp. Sec. horol. Oſcil. ex Alt. Correct.			Ordo Phaſum.	Altitudines Fixarum Nec non Animadverſiones quædam notatu dignæ	Per quas Maculas tranſiverint Umbræ Sectiones.
H.	'	"			Phaſes Creſentes.
8	35	20		Stellula c, Suprema ſcil. à tergo	Pollucis, ad Lacum Merid. ſubiit.
8	51	20		Stellula d ad ipſum limbum	inferiorem occultata.
9	9	10		Stellula c rurſus emerſit, ſub	Monte ſc. Nevoſo; Sic ut ☽ ad 3'. 20". ſubingreſſa fuerit. Spectaculum ſanè erat jucundiſſimum, hæcce omnia dilucidiſſimè, & quidem ſub ipſâ ferè maximâ obſcur. & ☽ᵃ ☌ deprehendere.
9	12	30		**Emerſio Lunæ ex umbra ;**	Contigit ad 30° ferè limbi ☽ à puncto Nadir ortum verſus.
					Phaſes decreſentes.
9	20	20	17.		Umbra inceſſit per Pal. Maræotidem, Fontes Amaras & M. Eoum.
9	25	0	18.		Per M. Audum, Ajacem & Troicum.
9	30	20	19.		Per M. Pentadactylum, Campharum, S. Sirbonis, & M. Lion.
9	32	40	20.	Mons Porphyrites exiit ex umbr.	Per M. Porphyrit. Caſium & Didymum.
9	36	5	21.	M. Sinai illuminari cœpit.	Per M. Baronium, ad I. Siciliam, per Cretam ad radices Sinai.
9	42	15	22.	M. Ætna ſub ipſa ſectione umbr.	Per Promontorium Apollinis, M. Ætnam, per Rhodum Monteſque Seir.
9	47	10	23.		Per Inſ. Vulcaniam, M. Maſicytum, Cragum & Antiliban.
9	51	0	24.		Ad L. nigrum majorem, S. Paſtanum, M. Didymum, & Montes Coibacaronos.
9	56	50	25.	Inſula Besbica rurſus prodiit in lucem.	Per S. nigrum minorem, ad I. Besbicam, per M. Uxerios.
9	59	35	26.		Per L. Salmiderſam, M. Horminium, Moſchum & Lacum Thoſpitis.
10	5	0	27.		Per Pontum, I. Cyaneam, S. Athenienſem, & M. Caucaſum.
10	7	0	28.		Per L. Boryſthenem, ad I. Apolloniam, Pr. Heracleum ac M. Tanconem.
				Cæteras phaſes, ob nubes intercurrentes debitè obſ. non licuit.	
10	19	0		Umbra adhuc notata.	
10	19	35		Umbra nondum planè exiverat.	
10	20	0		**Finis Eclipſeos.**	
10	23	0		Penumbra.	Quam tamen diutius aſſequi, ob denſiores nubes & vapores haud potuimus.
10	52	58		Altitudo ♂ 37° 12' 0"	
10	58	35		Altitud. Lucidæ ♈ 28 52 0	
11	11	33		Altitud. Capellæ 70 11 0	
11	15	20		Altitud. Capellæ 69 39 0	
11	16	59		Altitud. Capellæ 69 24 0	

The Improvement of Cornwall *by Sea ſand, communicated by an Intelligent Gentleman well acquainted in thoſe parts to Dr.* Dan. Cox.

'TIS well known, that *Lands are valued* according to the *nearneſs* or *diſtance* of that commodity. Near the Sea, or a navigable River are few of thoſe waſte and unimproved Lands. I have much wondred, that the Sea-ſand (being ſo advantagious) has not been uſed in other parts of the Nation. I know, there is the ſame *ſhelly* ſand on moſt of the Coaſts of *England*, yet it lies wholly neglected. The reaſon of it is (I think) that the *Labouring part* do ſeldom travel, or remove, ſo as to learn by others experience: And the *Gentry*, that ride abroad, do little mind theſe things. However, ſince our Country has the happy uſe of it, and would abundantly more, were it not for the charge of carriage; I think it expedient to enlarge upon this head. *Tinn*, and *Fiſh*, are two noble Staples of the County, and this of *Sea-ſand* (if I miſtake not) may be ſo ordred as to be as good as either.

Now becauſe this diſcourſe may come to the hands of ſome other Country men, to whom it may do good; I ſhall for their ſakes deſcribe this Sand, to make them eſteem and uſe it (if they pleaſe) for their own advantage.

This Sand is that which is commonly at or near the Sea-ſhoar, which to diſtinguiſh from what is uſeleſs; know, That the waſh of the Sea rolls and tumbles ſtones & *ſhells*, &c. one over another, whoſe grating makes this Sand. If the matter be *ſhelfy* (as we call it) that is the grating of *ſtones*, it is of ſmall valew. But if it be notably *ſhelly*, then it is what we deſire. And of this *ſhelly Sand* are three colours in our County. About *Plymouth* and the Southern coaſt the Sand is *blewiſh* or *gray*, like aſhes: which I conceive to be from the breaking of Muſcles chiefly and Oyſter-ſhells mixed with it. Weſtward near the Lands end, the Sand is very *white*, and in *Scilly*, *gliſtering*. This I think comes from the mouldring of Mooreſtones, or a kind of Freeſtone mingled with very white ſhells, ſuch as are called (when the fiſh is preſerved) Scollops. On the North-ſea from about *Padſtow* and Eaſtwards to *Lundie* the Sand is rich and of a *brown-reddiſh-yellowiſh* colour, and is moſtly of the broken ſhells of Cockles; which I gueſs to be of that colour there, from the waſh of the *Severn*, which falls very dirty into the *Severn-ſea*, and perhaps that accretion of the ſhells may be tinged thereby. This we know, that though there be little or no Sea-fiſh near the mouth of the *Severn*, becauſe of the muddineſs thereof, and therefore fiſh is carried to be ſold as far

as

as from *Loo* on the South-ſea to *Barnſtable* on the North; yet lower down in the North-ſea, though there be not ſo much, yet that, which is, is fatter and better then what is taken in the South-ſea.

Now beſides theſe *colours* of Sands there is alſo a difference in the *greatneſs* and *ſmalneſs* of the grain. Even in the ſame Harbour of *Plymouth* in ſome Coves 'tis very ſmall, in others greater grain'd; and is uſed variouſly for divers purpoſes. 'Tis ſaid, that the *ſmall* is beſt for the *Tenant* who only takes to tillage for 4 years, becauſe it works ſooner and yields its ſpeedy return. The *larger* grain'd (they ſay) is better for the *Landlord*, and the Land: becauſe it abides longer in the ground, and makes the paſture afterwards the better.

In *Falmouth* haven near St. *Mauſe*-caſtle there is a ſort of Sand or rather *Coralline*, that lies a foot under the *Ouſe*, which *Ouſe* being removed and the bed opened, this Sand is taken up by a dredg, and is uſed about *Truroe*, *Probus*, &c.

Weſt of the Mount in *Portcuthnoe*-cove is a *large ſhelly* Sand. In *Whitſand-bay* and about St. *Ives*, it is very white and ſmall.

About *Minver*, *Perinſand*, and *Lelant*, the Sands are *blown up* by the wind, and drown abundance of good Land; ſome Houſes, yea and ſome Churches and Chappels are even buried with it. So that the Hills ſides that are towards the Sea, may be thought like thoſe ſandy deſarts we read of in *Arabia*, nor has any Art been hitherto thought of, to prevent its devaſtation.

Now of all thoſe Sands the *beſt* are accounted, as to *colour*, firſt the *reddiſh*, next the *blew*, then the *white*. As to *kinds*, the moſt *ſhelly* and the *coralline* are beſt: And that which is taken up from *under the Salt-water* either by dredges, or being left open by the ebbing of the Tyde. The *blown Sand* is accounted of *no uſe*. And generally if Sand be well drained of the Salt-water, ſo that it may be more conveniently carried, 'tis better than that which has layn long drying in the Sun and Wind, which take off much of its vertue.

Theſe uſeful Sands are *carried by Lighters* as far up into the Country as the Tydes will ſerve to that purpoſe, and there they are caſt on ſhoar; from whence they are fetched in ſome places by *wheels*, but in moſt (by reaſon of the hillineſs, narrowneſs, and badneſs of the ways) on *Horsback*; one Horſe carrying about 13 or 14 gallons. Seven or eight of theſe horſes tail'd together are call'd *a train*, which one man drives to 9 or 10 miles from the Sand-place, where each ſeime (or horſ-load) with the carriage comes to about 8 *d.* or 9 *d.* in ſome places, though not ſo much in others: for where it is dredged out of the Sea, it coſts 12 or 13 *s.* the Lighter (conteining ſixſcore ſeime) at the landing Key, or Sand-place: But where it is loaded from the dry beach after the ebb, it is not above 4 *s.* the Lighter; and all this charge of Lighterage is beſides the land carriage. This land carriage I have computed to amount, in the whole County, to about 32000 *l. per annum.*

When this Sand is brought home, it is ſpread on the ground intended for wheat, or uſually in the *firſt crop* of 4, whatever be the grain. For after 4 crops 'tis our cuſtom to leave our land to paſture for 6 or 7 years before we Till it again. And indeed the graſs will be ſo good immediately after Tillage, that we commonly mow it the firſt year. This is call'd *mowing of gratten.*

The *Corniſh aker* is 8 ſcore yards of 18 foot to the yard; in one of which akers good husbands beſtow according to the nearneſs or diſtance. Near the Sand 300 ſacks (that is horſe-ſeime or burthen:) Where men go 3 turn a day, about 200. Where 2 turn, 150. And where but 1 turn, 80 or 100. And ſo proportionably in greater diſtance, even to 20 or 30 ſacks in an aker, rather then none.

The effect is uſually, where *much ſand* is uſed, the *ſeed is much*, and the *ſtraw* little. I have ſeen in ſuch a place good Barley where the ear has been even equal in length with the ſtalk it grew on: So that the ſaying [*a buſhel of corn to a peck of ſtraw*] is not altogether incredible. But where *leſs Sand* is uſed, there is much ſtraw, and but *little*, and that *hungry* grain.

After the Corn is off, the graſs becomes moſtly a *white Clovery*, with ſome *purple*, if the land be deeper. And this graſs of well ſanded ground, though it be but *ſhort*, yet as to *feeding*, giving good *creams*, plenty of milk, and all other good purpoſes, it far *exceeds* the *longer* graſs, where leſs Sand is uſed. Yea garden herbs, and fruits, in thoſe places, are more, and thoſe better in their kind. In thoſe well ſanded places alſo little or *no ſnow lies*; there is a continual *winter-ſpring*; an *early harveſt*, (a month or 6 weeks before what is within 6 or 7 miles of the place;) yea ſuch a vaſt *difference of the air* is found in ſo little a diſtance, that a man may in an afternoon Travel as it were out of *Spain* into the *Orchades.*

Now for the benefits of Sand, found by long experience, the poor Country man is at a vaſt charge and trouble for the procuring of it, as is before noted.

From this diſcourſe of Sand and our experience of it I may draw theſe *corollaries.*

1. It may be worth while for ſome ingenious *Chymiſt*, *to open* the body of *Sand*, thereby to diſcern its ſeveral principles, that are moſt prevalent: And then for ſome good *Naturaliſt*, to conſider how it becomes ſo advantagious to *Vegetation*, and eſpecially as to that part which concerns the *prolifique Seed*.

2. It may be alſo worth while for ſome ingenious *Husbandmen* or *Gardner*, to make ſome tryal of Sea-ſand, if it will not ſome way anſwer expectation in theſe Eaſtern parts. For their encouragement,

    1. There *is Sand* (not much unlike our *Plymouth* ſand) which is taken up in the *Thames* about *Erith*, made uſe of by Brickmakers, and brought to them by Lighters at reaſonable rates.
    2. A Brickmaker told me, that by the *ſides of his Sand-heap* the graſs did *better ſpring* than elſewhere, and turned to a *clover-graſs*.
    3. In our Country we have almoſt *all kinds of Soyles*, and Sand *agrees* very well *with each* of them: And therefore the conceit of a diverſity of Soyle, and another nature of the ground, may be no diſcouragement.
    4. 'Tis well known, that *Sandwich Carrots and Peaſe* are well eſteemed, and they grow there, where the Sea-ſand has a little over-blown and mixed with the Soyle.

3. If you find this do any good, the *Thames* may be ſearched where is Ouſe about *Blackwall* or a little lower, by removing about a foot of the mudd, to ſee if there be not ſome *beds of ſhelly ſubſtance* or *Coralline* under it, as it is in the mouth of *Falmouth*; and if ſuch ſtuff may be found, it may be cheaper than what is farther fetched, and may do well.

4. But eſpecially *our Country men* who are ſatisfied in the experience of it, ſhould ſeriouſly bethink themſelves, If there may not be an *eaſier* and *cheaper* way of *Conveyance*, for a greater quantity thereof to be brought up into the middle of the Country. And that is the next thing we ſhall ſpeak ſomething to, *&c.*

I. *HERMETIS ÆGYPTIORUM & CHEMICORUM SAPIENTIA, ab* Hermanni Conringii *Animadverſionibus vindicata per* Olaum Borrichium, *Hafniæ*, *A.* 1674. *in* 4°.

THe learned Author of this Vindication begins his Book with ſhewing againſt his famous Antagoniſt, that the Ægyptian *Hermes*, as an excellent Man, a great Phyſitian & Chymiſt, hath well deſerv'd of all Mankind, and conſequently is highly injured by *Conringius* his Detractions. In this part the Reader will meet with ſtore of good Learning and Antiquity, and ſee, among many other particulars, that *Pythagoras*, one of the beſt and moſt ſolid Philoſophers and Mathematicians among the Antients, learn'd his Philoſophy in *Ægypt*; that the great work of Tranſmutation is due to this *Hermes*; that from thence the Ægyptians acquired that immenſe wealth, whereby they raiſed ſuch vaſt ſtructures; that thoſe Ægyptians were ſo skilful in making artificial Gemms, as that in luſtre and hardneſs they vyed with the true natural ones; thoſe ancient Artiſts being maſters of three things in this their work, which by the *Grecians* were called, ἀραίωσις, βαφὴ, σύμψις; the *firſt* implying a laxity of pores, ſufficiently to imbibe the tincture; the *ſecond*, a ſtrong adhæſion and due luſtre of the color; the *third*, a hardning again of the body of the gemm, after the ingreſs of the tincture. Where our Author takes occaſion to alledge a paſſage in *Raymund Lulle* his *Teſt.ult.ad Regem Angliæ* about a real change of Cryſtal into a very Adamantin maſs; *Vidiſti* (ſaith he) *Rex, mirabilem illam projectionem, quam feci tecum Londini, in camera tua ſecreta S.Catharinæ, verſùs partem Caſtelli, ſuper Cryſtallum ſolutum cum aqua argenti vivi, & converti eum in maſſam unam Adamantis finiſſimi, & virtuoſi, pluſquam naturalis, ex quo feciſti columnulas pro tabernaculo Dei.*

He takes alſo notice of another particular, ſtrictly obſerved among the old Ægyptians, which is, That each of their Phyſitians applyed himſelf to the knowledge and cure of one only Diſeaſe, whereby he became very ſagacious and expert in recovering his Patients of ſuch a malady; which way could not but conduce very much to the improvement of Phyſick, and the benefit of the people.

Nor does he paſs by, that the moſt celebrated Men of *Greece* travelled into *Ægypt* to acquire acknowledge, and gained ſo conſiderable advantage of their travels, as anſwer'd their expectation.

And whereas *Conringius* tells us of his own thorow-inſight in the manifold learning and knowledge of the *Grecians*, and admires the ſame above that of other Nations, challenging our Author to ſhew any thing among the *Ægyptians* like that of *Ariſtotle*'s Hiſtory of Animals, of *Theophraſtus* of Plants, of *Euclid* and *Archimedes* in Mathematicks, of *Ptolemy* in *Aſtronomy*, of *Hippocrates* and *Galen* in Phyſick: Whereas, I ſay, *Conringius* does this; our Author ſcruples not to reply; 1. That, without detracting any thing from the Grecians, if we ſhould ſit down and acquieſce in what the Greeks have deliver'd to us, the knowledge of Nature and the skill of Phyſick would be very imperfect and lame. 2. That, *Ariſtotle* hath erred groſly in many particulars in his Hiſtory of Animals; and that for the greateſt part of what is true therein, he was beholden for it to Fiſhermen, Hunts-men and Fowlers; beſides what he had learn'd of *Plato*, inſtructed by the Ægyptians. 3. That *Theophraſtus* hath made no thorough inveſtigation of any Plant,and left a very great number of them untouch't, owing alſo much of what he knew to the Ægyptians. 4. That *Euclid* lived a while in *Ægypt*, a Country much addicted to Geometry and Arithmetick: And that *Archimedes* found in *Ægypt* his famous *Cochlea ad exhauriendas aquas*; witneſs *Diodorus Siculus*. So that our Author judges it reaſonable, we ſhould think our ſelves more obliged to the *firſt Inventors*,than the *Promoters*,of uſeful knowledge. And as for *Hippocrates* and *Galen*,he ſaith, that *Cos*,the Country of the former,was ſo near *Ægypt*,that doubtleſs he thence received great advantage to his Medical knowledge; and that *Democritus*,his Maſter,who had been long acquainted with *Ægypt*, had queſtionleſs ſuggeſted many things to him: That *Galen* alſo had lived long at *Alexandria*, and was wont to adviſe the Grecian Candidats of Phyſick to travel thither for experience. As for *Ptolemy*, that he was no Grecian, but an *Alexandrian*, or a *Pelnſiot*, and conſequently of *Ægypt*.

And ſeeing that *Conringius* inveighs with a virulent ſtyle againſt *Hermes* and *Paracelſus*, our Author inquires the more narrowly into the Morals and Doctrines of *Ariſtotle*, ſo much extoll'd by the ſaid *Conringius*, and ſhews, that the former of theſe two was much polluted, and the latter very jejune, perfunctory, and erroneous. Where he takes occaſion both to ſhew the many falſities deliver'd by *Ariſtotle* in his Hiſtory of Animals, particularly in that of the *Lyon*, *Eagle*, and *Crocodile*, and to rectifie the ſame, eſpecially in the Hiſtory of the Crocodile; of the Anatomy of which he here gives us an accurate and conſiderable account.

Again, foraſmuch as *Conringius* undervalues Medicines prepared of Minerals, our *Borrichius* enumerates the Diſeaſes, that are not cured but by them, ſuch as the *Lues venerea*, ſtubborn Hypochondriacal affections, Epilepſies, inveterate Head-aches, latent Abſceſſes in the Body, old and malign Ulcers, *&c.* And *Conringius* being poſitive in aſſerting, that no force of fire is able to diſſolve Gold, our Author mentions a way to perform it with a heat, at firſt ſcarce ſenſible, which he affirms to have been experimented by his late Majeſty of *Denmark*, *Frederick* III; who commanded a thin plate of very pure Gold to be ground in a mortar, until it was reduced into a darkiſh powder, which being afterwards put into a Glaſs-retort, and driven by a ſtrong heat, yielded a very red liquor, which tinged ſpirit of Wine, and became a good potable Gold. On this occaſion he relates, what himſelf hath performed about Gold, *viz.* that, without the uſe of any fire, by the ſole phlegm of common *acetum*, after a previous ſlight circumſtance, (which yet he names not) out of very fine gold he drew a greeniſh Tincture, which, if in ſummer it were left in an open glaſs, would, upon the exhalation of the liquor, be converted into a greeniſh ſalt, which converſion whilſt it was doing, the liquor in the glaſs would ſtir up and down in a ſtrange manner, ſhooting corporeal rays downwards, long and very fine, not unlike the rays of the Sun, only that they were whitiſh, and ſending forth green branches upwards: Which ſpectacle he ſaith he hath often ſhew'd to his friends coming to ſee him; that ſalin texture laſting long, nor being diſſolvable but by violence. To this he joyns his Aſſertion, grounded upon Experiments, that Corals and Gems yield Salts; which *Conringius* denieth.

Diſcourſing of the vertues of Præparations made of *Animal* ſubſtances, and particularly of the *ſpirit of Bloud*, he declares, that the volatil ſpirits of *human* bloud are more powerful in the curing of the Epilepſie, than thoſe of the bloud of other animals; refuting withal the aſſertion of *Conringius*, importing, that the Ancients did not employ Human bloud but among their Magicks.

Examining the Controverſie, Whether the vertues of Purgatives or Vomitives paſs into their diſtilled waters, he recites an Experiment he made upon a Dog with the diſtilled water of black *Hellebore*, which was, that having given him 12 ſpoonfuls of it, he did within 4 hours vomit 4 times, and dunged twice, all very copiouſly.

Diſcuſſing the Queſtion about the *Reſuſcitation of Plants*, (which he ſeems inclin'd to maintain,) he alledges, for the countenancing of it, the Regeneration of bodies of other kinds, and amongſt them he takes notice of *Mercury*, affirming, that that ſubſtance, having been a whole year vexed by various fires, and reduced into water, turbith, and aſhes, will, by the attraction of the Salt of Tartar amidſt the flames, return to the priſtin liquor: And that *Lead*, reverberated into *Minium*, melted into glaſs, reduced into a ceruſs, burnt to a Lytharge, in a word, tormented, torn, or burnt, as you pleaſe, will in a trice riſe again into genuin Lead, by a bare dextrous application of Lixiviat Salt.

Diſcourſing of the *Signature of Plants*, concerning which *Conrin-*

gius affirms, that not any footſtep of it is to be found in all Antiquity; our Author alledges to this famous Antiquary ſeveral paſſages, out of *Dioſcorides*, and *Pliny*, clearly evincing the miſtake of his Adverſary.

Conringius affirming, that all ſorts of Diſeaſes have been cur'd without *Chymical* remedies; our *Borrichius* maintains, that the *Lues venerea*, a confirm'd Dropſie, and Phthyſis, and Cancer, and ſeveral other maladies will very hardly be cur'd by meer *Galenical* medicaments.

It being controverted, in what ſenſe the Three Principles of the Chymiſts are contained in Bodies; our Author labours to explain it; relating withal an Experiment of his own, (too long to be inſerted here,) in which he affirms to have obtained them all three out of common limpid water.

Concerning the Queſtion, whether there be actually Salt in bodies before combuſtion or the operation of the Fire; Dr. *Borrichius* endeavours to defend the *Affirmative*; and in the end of that Diſcourſe undertakes experimentally to ſhew, that, without any combuſtion at all, Corals, Cockel-ſhels, Stones, Gems, if they be ground to as fine duſt as is poſſible, will, by a ſimple, though ſomewhat long, decoction in common diſtilled water, yield ſome true Cubical Salt, to be ſeen after the liquor is ſtrained, and abſtracted to a ſpiſſitude. The like he affirms he hath found by Experiment in *Metals*, Gold it ſelf not excepted; the proceſs whereof (which is by grinding) he deſcribes at large *lib.* 2. *c.* 7; expecting the judgment of the Intelligent Reader upon it. After which he intimates, that though he could not obtain any viſible Salt out of *Quickſilver*, yet he is perſwaded from certain effects, that it holds ſome. For, when once he had crowded an oblong glaſs full of thin and well-poliſht plates of Steel, and put to them ſo much highly defecated Mercury, as filled up all the interſtices, and being very carefully ſhut, expoſed it for three months to the Summer Sun; he at length breaking the glaſs, found not what he looked for, to wit, an Amalgama of *Mars*, but what he looked not for, which was, that almoſt all thoſe Steel-plates were ſeiſed on by ruſt, though immerſed in the very body of the Quickſilver: which to him is an argument, that in it there was ſomwhat ſaline but volatil, that excited the Iron to protrude the ruſt. This ſaline ſubſtance he thinks to be wanting in no Element; where he noteth, that he hath obſerv'd it not only in a mans breath, being in winter carefully collected in a glaſs, and by a gentle heat inſpiſſated;

ted; but alſo in Air, crowded together in a wind-gun, which Air, he ſaith, when let out again into a Tin-veſſel, turns into water, which, after a ſimple exhalation, is not without ſaltneſs.

What he hath thus proved of Salt, he alſo labours to prove of Sulphur and Mercury; I mean, their In-exiſtence in all Mixts, whether Vegetable, Animal, or Mineral.

In the Concluſion of the whole, our Author makes it his buſineſs to ſhew, that *Paracelſus* his Manners had been too ſeverely repreſented; but, whatever they were, that that ought not to rob him of the praiſe due to his knowledge. Again, that being provoked by a crowd of Enemies, he had indulged too far to that human imperfection, which is inclined to retaliate with recriminations; Yet that he had not been a Magician, in the worſer ſenſe; of which Crime the Learned *Naudæus* alſo had upon good grounds purged him. Moreover, that though his ſervant *Oporinus*, gain'd by his Maſters Adverſaries, had virulently inveighed againſt him; yet may there be gather'd out of that *Oporinus* his Epiſtle more matter of praiſe for *Paracelſus*, than (as our Author ſpeaks) all his Enemies together have deſerv'd; foraſmuch as 'tis there ſaid; *Fuiſſe in Paracelſo mirabilem faciendi medicinam in omni morborum genere promptitudinem & felicitatem:* Again, *In curandis ulceribus, etiam deploratiſſimis, miracula eum edidiſſe, nullâ victûs præſcriptâ aut obſervatâ ratione:* Item; *Laudano ſuo ità gloriatum fuiſſe, ut affirmare non dubitârit, ejus ſolius uſu ſe è mortuis vivos reddere poſſe; idq; aliquoties, dum ille (*Oporinus*) apud ipſum fuit, declaraſſe.*

Mentioning *Paracelſus* his skill in making the grand *Elixir*, (as they call it) our Author recites a Narration made in his hearing by the Count of *Windiſhgratz*, the Emperours Ambaſſador at the Daniſh Court, concerning a perſon, that was poſſeſſor of that great *Arcanum*; which becauſe 'tis very curious and more than ordinarily circumſtantiated, we ſhall take the liberty to transfer it hither, in the very words of our Author; *viz. Vivere hodie in aula Cæſaris hominem* 28 *circiter annorum, ex Auguſtiniano pridem monacho nunc Chemicum, qui pulviſculo ex rubro purpuraſcente Metalla quævis in obryzum purgatiſſimum facilè convertit, & plurimis ibidem apud maximos, medioxumos, nonnunquam etiam minimos, inclareſcit Experimentis: Vel triginta homines* Viennæ *oſtendere, confectum ab ipſo. ſe inſpectantibus, nobile illud metallum; atq; inter eos Illuſtrem Comitem* Auguſtinum Wallenſteinium *pectus quotidie aureo torque operis illius Chemici inſignire: Quin & Illuſtrem Comitem* Breunerum *contemplatum eſſe, Stannum menſarium in Aurum tingentem; alios, metallorum alia. Cúmq; vitæ ſit paulò diſſolutioris, atq; magiſterii (quod non diſſimulat) ignarus, exiſtimare nonnullos, in monaſterio quodam Pragenſi, inter moribundi cujuſdam Patris capſulas, theſaurum hunc indeptum fuiſſe: Ipſum autem, cúm ante menſes aliquot ex febre periculoſé decumberet, inquirente in rem Medico, profeſſum, ex indiciis quibuſdam ſe inductum, ut latentem alicubi, quem olim* Paracelſus *ſepoſuerat, lapidem Philoſophicum, fodiendo inveſtigaret, quæſiviſſe ſollicitè & reperiſſe.*

II. *The* Garden of Eden, *or an Accompt of the* Culture of Flowers *and* Fruits *now growing in* England; *with particular Rules, how to advance their Nature and Growth, as well in* Seeds *and* Herbs, *as in ordering of* Trees *and* Shrubs: *In 2 parts, in* 8°. *written by Sir* Hugh Platt *Kt; newly reprinted.*

THis, I think, is the firſt time, I take notice of a ſmall parcel of a late Writer, only reprinted, and without additions. And this I do with great reſpects for the pains he took, to promote, ſollicite and communicat Experiments and Inventions; to accommodate all occaſions of Human Life, for all conditions of men, for Neceſſaries, and in all extremities; and for Delicacies, Treats and Entertainments, and generally with more than ordinary ſucceſs. This will appear by a few Touches, which I ſhall here give upon three of his Books formerly publiſh't: 1. This *his Garden.* 2. His *Jewelhouſe.* 3. His *Cloſet.*

1. The *ſecond* part of his *Garden* came forth poſthume *A.* 1660; in the preface of which 'tis ſaid, That the Firſt part had four Impreſſions in leſs than ſix years. This Collection (as himſelf computes them) is of 200 Experiments in that firſt part, and of 118 in the ſecond part. Not, that he aſſumes them all for his own Experiments, nor gives his warrant for them all: But whatever he could obtain from all the famous Gardiners of his time about *London* or elſewhere, by exchanges of his own diſcoveries, or by purchaſe, or by frequent viſits, or by addreſſes, he briefly publiſhed, conſtantly naming or indicating the right Author, Theſe he calls his *long, coſtly* and *laborious* Collections, not written at adventure, or by an imaginary conceit in a Scholars private ſtudy, but wrung out of the Earth by the painful hand of *Experience*, ſaith he. And this ſmall Manual may do Gardiners more good, than many large and methodical Volumes, which are fitter to furniſh the Libraries of Theoriſts, than to grace our Gardens with the beſt demonſtrations of this practical and operative part of Nature.

We want more ſuch worthy perſons, to *report the progreſs* of all Tryals and Improvements in theſe affairs, ever ſince his Majeſties reſtauration. And now more eſpecially, ſince the *Inoculating* of *herbs*, *flowers* and *ſhrubs*, and the *graffing in Roots*, and the *mixing* and *uniting of Vegetables* by the *Roots*, and the *twiſts of the roots and ſtems, incloſed under one bark or rind*, and many other operations upon *bulbous flowers*, are in advance, upon grounds of well-confirmed Experiments; and ſince the *Anatome of Vegetables*, which may direct the moſt curious operations, is ſo accurately handled (as will ſhortly farther appear;) and withall, ſince we begin to diſcourſe ſo warmly of *propagating Mulberies* and *Vines* in *England*: For the later of which our Author hath given us good aſſurance and encouragement in his *ſecond part* of Gardens, *Sect.* 40.

Mean while we muſt acknowledge, that ſome of our *Engliſh* have lately done excellently well for *Gardens* and *Orchards.* And the firſt and beſt Maſter in *France*, for the manner of *Walling fruit*: The Sieur *le Gendre*, and the *French Gardiner* were elegantly Engliſh't about the year 1660. But yet this was peculiar in our Author, that he excited the adventures of all the expert Gardiners he could hear of, and communicated the beſt of their reſults: which was more than any one man could,in ſo ſhort a time,perform: This can only be done at *London*, where there are Clubs of expert Gardiners,apt to aſſay *Novelties* and *Rarities*; and where they may have the fulleſt intelligence from other parts,and can moſt effectually diſperſe all over *England* what is moſt for common good.

2. His *Jewel-houſe* came abroad *A.1653.* containing 149 chapters; perhaps more Experiments and Obſervations, than Chapters. To which the Printer has added *anothers* Diſcourſe of Gems,Gums,&c.which ſome think not worthy to be annexed. Here alſo he aſſumeth not all for his own, but often vouches his Author,or Inſtance. And ſometimes he may miſtake, or be miſ-informed. Neither muſt it be expected, that I ſhould give a Judgment on thoſe *few inſtances*,which I ſhall contract here out of many, which may perhaps be no leſs conſiderable.

For *Seamen* he directs, how to preſerve freſh water a long time from putrefaction,*c.*5. He provides a wholeſom,laſting and freſh Victual for the Navy,*c.*147.A portable eaſie Pump,to drain Fens,ſtanding Pools and Ponds, to caſt water on banks out of a River,and to do good ſervice upon any ſuddain,or a great leak in a ſhip,*c.*146. To keep Oiſters good ſome time, and freſh,*c.*88.The like for Lobſters,Crayfiſhes,Prawns,&c.*c.*89.I omit the ways he firſt taught to preſerve Roſe-leaves,and other flowers, the Juice of Orenges,Lemons,and other Juices in all particulars,all the year; Artichocks, (the dainties of Princes of old, and lately ſo in *England*, ſaith *Muffet*;) all the Winter,c.1;and all the Lent,*See Cloſet*,b.69; and divers other kind of fruit, c.1. here in his *Jewel-houſe*. He ſhews c.4. how to preſerve and keep ſweet any fowl or other fleſh, for three weeks or a month, in exceſſive hot weather.

For *Travellers* he offers a light garment, yet ſufficient againſt any rainy weather,c.149. if later cheats have not diſgraced the invention: A drink for travellers *ex tempore*, when they cannot bear the change of beer on the road,c.25. Other helps to eaſe Horſe or Man in their travels, c.24.83.87.

For *Buildings*,a cheap mortar,*c.92*. To make ſmooth or gliſtering floors or walls, *c.90,&c.* He ſhew'd great reſpects for honeſt *Chymiſtry*, and was careful in directing Diſtillations,for Salts,Spirits,Oyls,and ſhewing various uſes of them: But he gives cautions againſt the cheating Alchymiſt, *c.99*; againſt ſome Vintners and Marchands of Wine,*c.73*; againſt frauds in ſome Brewers,*c.9*. For the Curioſity,he ſhews,How a Dutch Jeweller did cement two of the *Queens* Cryſtal-cups that were broken, and teaches other cements,*c.50*. But we expect better Cements from a more learned and honorable Philoſopher. He hath many devices to eaſe the charge of Artificers; for cheap and long laſting candles,and double lights, cheap fuel, drinks in extream wants,and for delicacy. But above all, he advanced the *Agriculture of England* by Marle,Saline materials,as far as the Seas extend, which encompaſs theſe Iſlands; and by other Soyles,*c.104*; chiefly by Lime, and the way of Denſhiring; whereby the moſt barren lands,hills and waſts may be converted to bear the richeſt burthens of corn, hay, and graſs.

3. His *Cloſet* was publiſht in two parts,bound together,*A*.1651. The *firſt* part contains Preſerves, Candying, Paſtes, Banqueting conceits, Cordial waters,Conſerves,Medicins and Salves. The *ſecond* part has more of the ſame, or the like, as Preſerves,Conſerves,Candying,Secrets in diſtillation,Cookery and Huſwifry,Sweet powders,Ointments.Further,our Author,having enlarged noble tables, furniſh't neceſſaries for multitudes of the moſt indigent, enriched husbandmen, ſound good employments for younger and ſincking families,aſſiſted and encouraged ingenuous Arts and honeſt Trades,invented many new, and revived unregarded or too much neglected accommodations,and having taught,how the Sea-waters and Sea-ſand may be made a fertiliſing compoſt,and the very Earth a relieving fuel;he thought it beſt to ingratiate with Ladies, to do many of the good offices of charity, to heal the ſick,lame,maimed and wounded, who by poverty were unable to diſcharge Apothecaries bills,Phyſitians and Chirurgions; and to impart the elegant huſwifry for delicacies,treats,and collations.He taught them,how to convert the wholeſom plants and bloſſoms of their gardens and common fields,hills and paſtures,and the fruit of buſhes,ſhrubs and hedges,and many of our taller trees, to be ſound food and rich wines; even to challenge the blood of the grape; and under the favour and with the aſſiſtance of the *Sugar-cane*, and ſometimes with the help of the Alembick,to carry the general applauſe,and to triumph in victory.And what had now become of our *Sugar-plantations*, if he had not ſo happily begun when he did, to ſhew us the excellencies and infinit uſes of Sugar. And as to his *Cookery*,*COLUMELLA*,who ſpake the moſt he could againſt it,yet himſelf inſtructs, How to order Wine,and other liquors,pickles,gamons,and other food,for the beſt; and marmalades,quidenies,and conſerves,moſt agreeable for the Empreſſes of thoſe days,when the Bee ſupplied the want of Sugar-canes.And good Cookery is as ancient,as the reputation of the moſt famous Phyſitians,a noble part of their profeſſion.Emperours and Popes had always learned Phyſitians for Maſter-cooks.And our Author was follow'd with the Cabinets and Cloſets of both Illuſtrious and Learned Perſons:The Counteſs of *Arundel*'s Cloſet,the Counteſs of *Kent*'s, Sr.*Theod.Mayern*'s, Sr.*Ken.Digby*'s,the Queen-like Cabinet,the accompliſh't Cook,the French Cook,and *Rabiſha*'s Body of Cookery: Theſe two laſt reviſed and perfected for the year 1673. And for ſure and moderat Cookery, *Muffets* Improvement of Health, reprinted 1665, and,as Dr. *Bennet* thinks, worth all that wrote before him,not excepting *Platina*,*Apicius* and *Alexandrinus*. At this day,*Barbados* and *Jamaica* are the better for *Ligons* skill in Cookery.And,if the Sturgeon of *New England* be the right Sturgeon,and ſo choſen and order'd,as *Muffet* directs, it may be a ſervice (as of old) for an Imperial Table. And all Commanders and Purſers at Sea are concern'd for good marinal pickles, *&c.*

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*Errat.*in *Numb* 112. Pag.256. l.10. r.*other requiſits.* p.257. l.17. r.*ſerve out Apprenticeſhips.*
*Errat.*in this *Numb.* 113. Pag.287. l.10. r.*receive delay.* p.290. l.24. r.*debité.*

London,Printed for *John Martyn*,Printer to the *Royal Society*. 1675.

Numb. 114.

PHILOSOPHICAL TRANSACTIONS.

May 24. 1675.

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Some Reflexions on the Tranſactions of April 1675; *ſent to the Publiſher in a Letter out of the Country.*

——I Thank you heartily for *Aprils* Tranſactions. And I am glad, that my Papers did not exclude any of thoſe particulars. If Dr. *Leibnitz* his Watch ſatisfies Experience, 'tis conſiderable. *Hevelius* his accurateneſs prepares freſh work for Aſtronomers. *Borrichius* may be *Cos veritatis*, to excite and provoke great Diſcoveries in Chymiſtry. 'Tis an excellent pen which gave you the *Sea-ſand* of *Cornwall*: In which ſpecial notice ought to be taken, 1. Of the profit compared to Tin and Fiſh. 2. That the Land-carriage, (beſides the charge of Lighterage) amounts to about 32000 *l. per annum.* 3. That ſuch a vaſt difference of the Air is found in ſo little a diſtance, that a man may in an Afternoon travel as it were out of *Spain* into the *Orcades*. In which latter note, beſides the arguteneſs, a deep hint in Philoſophy. I have remarked Springs and Soyle to the very ſame purpoſe. Note alſo *pag.* 296. this propoſal for Chymiſts, to *open the body of Sand*, &c. We find alſo by common Experience, that ſome Stones, and ſome Gravel (as ſuch) without other circumſtances, are much more impregnating than other. And I found, how to place ſome Stones above ground, ſome at a certain depth under ground, for ſurer fertility; and ſo for Sand and Gravel alſo.

But I wiſh, you could meet an intelligent man, who could find out ſome probable ground to proceed in a way of Calculation, What profit may be raiſed by any late Invention or any old deviſe for Soyle; for example,

1. The Land-carriage of Sea-ſand in *Cornwall* 32000 *l. per annum.*
2. The Lighterage. Some grounds are offered in the ſaid Tract of yours for a probable ſum.
3. What profit the Husbandman there expects, and, *communibus annis*, enjoys?
4. How many Labourers are by the ſame, or other appendages, employed and rewarded? For, if nothing were gained above a narrow livelyhood to the Husbandman; yet the ſum for Lighterage and Carriage is great, towards the employment of the poor, which is very much *bono publico.*

Ex-

Extracts of ſeveral Letters ſent to the Publiſher from Edinburg, *by the Learn'd Mr.* James Gregory, *to whom they were written by that intelligent Knight Sir* George Makenzy *from* Tarbut.

1. THE wind here, on the 21*th* of *Decemb.* laſt, was extraordinary: it broke a Standard-ſtone, that ſtood as an Obelisk near an old Church; which ſtone was about 12 foot high, 5 foot broad, and near 2 foot thick. Whole woods were over-turn'd, and torn up from the root, though in a low ſcituation. It blew from the North-weſt, and of a long time the wind had continued Weſterly. *Jan.* 16. 167$\frac{4}{5}$.

2. I had notice of a *Phænomenon*, that I judged odd and conſiderable in ſearching into the nature of *Cold*, which is; That there is a litle Lake in *Straherrick* on the Lord *Lovels* Lands, which never freezes all over (even in the moſt vehement froſts,) before *February*; but one nights froſt there-after will freeze it all over, and two nights then will make the Ice of a very conſiderable thickneſs. This I did inquire after very ſollicitouſly from the honeſteſt and ſobereſt of the adjoyning Inhabitants, and it was verified by ſo many, that there was left no place to doubt the truth of the matter of fact. I have ſince heard of two other Lakes, one of which is on Lands belonging to my ſelf, called *Loch Monar*, of a pretty largeneſs, which ſteddily keeps the ſame method, and I have inquired after it by many, who have affirm'd it to me on their own knowledge. There is another litle Lake in *Straglaſh* at *Glencanich* on Lands belonging to one *Chiſholm*; the Lake lies in a bottom 'twixt the tops of a very high hill, ſo that the bottom it ſelf is very high. This Lake never wants Ice on it in the middle, even in the hotteſt Summer, though it thaws near the edges: And this Ice is found on it, though the Sun by reaſon of the reflexion from the hills in that Country is very hot, and Lakes lying as high in the neighbourhood have no ſuch phœnomenon. 'Tis obſervable alſo, that about the borders of this Lake the Graſs keeps a continual verdure, as if it were in a conſtant Spring, and feeds and fattens beaſts more in a week, then any other Graſs doth in a forthnight. The matter of fact I have fully examined in both theſe; but to hit the cauſe, requires a better Philoſopher then I am, &c. *Februar.* 8. 167$\frac{4}{5}$.

3. Our famous Lake *Neſs* never freezes; but on the contrary in the violenteſt froſts the greater clouds of ſteams do ariſe from it. And I remember, that at two ſeveral times, I being at *Inverneſs*, walking in the evenings along the bridge over the River *Neſs*, a miſt of thoſe ſteams coming from the Lake and falling down to us over the River (for there was no miſt in any place thereabout but on this Lake and River only,) our hair became all white, like the whiteneſs of a hoare-froſt, but it was ſoft and warm; and this was in the midſt of Summer and in warm evenings. Laſt week I was ſpeaking with Dr. *George Makenzy* (who lives at *Inverneſs*) of this matter: He told me, that he obſerves *Roſemary* to continue in the gardens about that Lakes ſide, notwithſtanding the laſt Winters long and violent froſts; whereas a far leſs violent Winter ordinarily kills all the Roſemary which is in gardens that lye in warmer places and at the Sea-ſide: And, which is more, though I live near it, and in a better ſoyle and warmer ſcituation; yet any Winter, more than ordinary cold, kills my Roſemary, though cover'd over with ſtraw and litter: Whereas near Logh *Neſs* it remained good, though uncover'd, in the laſt ſharp Winter; which he attributes (and, I think, on good ground) to the warmth occaſioned by thoſe ſteams that frequently ariſe from that Lake. *Febr.* 25. 167$\frac{4}{5}$.

4. Having in my former Letters written of water, I ſhall yet add this of that ſubject; That in *Glevelg* at a place called *Achigniglium* there is a litle Rivolet, which ſo turns *Holly* into a greeniſh ſtone, that they ordinarily make moulds of it for caſting of balls for fuſees; and Tinkers that work in braſs make both their moulds and melting pots of it; and women their round wharls for ſpinning. May it not be, that by the long infuſion in water, deſcending from hills, which perhaps abound in marle capable to be reſolved into ſmall particles by the conſtant waſhing of the water, may it not be, I ſay, that theſe litle particles do intrude into the cleanſed pores of the *Holly*, and ſo make up that ſoft ſtone? And any thing ligneous remaining of the very hard timber, being all incruſtated with this marble, may it not thereby be guarded from the action of the fire? *April* 16. 1675.

Some Communications from Rome *and* Paris.

Signor *Borelli*, who is now at *Rome*, pretends to have lighted upon a way of building *Gallies* with ſeveral Tires of Oars, of different heights, which he eſteems to be more convenient, more ſpeedy and ſtronger than thoſe that are now in uſe. He thinks alſo, that he can give an account of the poſſibility of the Gallies of the Ancients to a determinat number of tires; and he promiſes a Treaty of it, with demonſtrations.

There is alſo at *Rome* a Bowle, which is ſo counterpoiſed, that it can ſtop of it ſelf upon an inclined plane like *Keplers* watch. It ſtops upon all ſorts of matter, and even upon a Looking-glaſs.

Pater *Gottignies* hath undertaken at *Rome* to write an *Algebra* after a new manner. He gives it the Title of *Logiſtica univerſæ Matheſi inſerviens.* It is to conſiſt of four Books, whereof the firſt is already printed.

Monſieur *Blondel* is buſie in giving us a new Mapp of *Paris*, which will be correct, and of the bigneſs of ſix foot ſquare. The like is alſo doing at *Rome* of that City by Signor *Buffalini*: But both will require a conſiderable time to finiſh them.

There hath been ſent to *Paris* the Title of a Book treating of the *Univerſal Meaſure*; the Author is an Italian, called Signor *Burattini*; and the Title as followeth: *Miſura Univerſale overo Trattato nel quale ſi moſtra, come in tutti i luoghi del mondo ſi può trovare una miſura & un peſo Univerſale, ſenza che habbiano relatione con niun' altra miſura & niun' altro peſo, & ad ogni modo in tutti i luoghi ſaranno li medeſimi & ſaranno inalterabili & perpetui, ſin tanto che durerá il mondo. La miſura ſi puó trovar in un hora di tempo; & queſta ci moſtra, quanto grave deve eſſer il peſo. Della queſta miſura ſi cavano ancora le miſure Corporee per miſurar le coſe aride & liquide.* See what Monſieur *Chriſtian Hugens* hath ſaid upon this argument in his Book *De Motu Pendulorum*, prop. 25. p. 151.

A Conjecture concerning the Bladders of Air that are found in Fiſhes, communicated by A. I; *and illuſtrated by an Experiment ſuggeſted by the Honorable* Robert Boyle.

REflecting on that Queſtion, Whether Liquids gravitate upon Bodies immerſed or not? I came to a Reſolution in my own thoughts, that they do gravitate; and one of the greateſt inſtances that did occurr to me was, that a bubble of Air, riſing from the bottom, does dilate it ſelf all the way to the top; which is cauſed by the leſſening of the weight or preſſure of the incumbent water, the nearer it is to the top. Upon conſideration of that inſtance, the following conjecture preſented its ſelf to my thoughts; That fiſhes by reaſon of the bladder of Air that is within them can ſuſtein or keep themſelves in any depth of water. For the Air in that bladder is like the bubble, more or leſs compreſſed, according to the depth the fiſh ſwims at, and takes up more or leſs ſpace; and conſequently the body of the fiſh, part of whoſe bulk this bladder is, is greater or leſs according to the ſeveral depths, and yet retains the ſame weight. The Rule *de inſidentibus humido*, is, that a Body that is heavier than ſo much water as is equal in quantity to the bulk of it, will ſink; a Body that is lighter, will ſwim; a Body of equal weight, will reſt in any part of the water.

Now by this Rule, if the fiſh in the middle Region of the water be of equal weight to the water that is commenſurate to the bulk of it, the fiſh will reſt there without any tendency upwards or downwards: And if the fiſh be deeper in the water, the bulk of the fiſh becoming leſs by the compreſſion of the bladder, and yet retaining the ſame weight, it will ſink and reſt at the bottom: And on the other ſide, if the fiſh be higher than that middle Region, the Air dilating its ſelf, and the *bulk* of the fiſh conſequently increaſing, but not the *weight*, the fiſh will riſe upwards, and reſt at the top of the water.

Perhaps the fiſh by ſome action can emit Air out of this bladder, and afterwards out of its body, and alſo, when there is not enough, take-in Air and convey it to this bladder; and then it will not be wondred, that there ſhould be alwayes a fit proportion of Air in the Bodies of all fiſhes, to ſerve their uſe, according to the depth of water they are bred and live in: Perhaps by ſome Muſcle the fiſh can contract this bladder beyond the preſſure of the weight of water: Perhaps the fiſh can by its ſides or ſome other defence keep off the preſſure of the water, and give the Air leave to dilate its ſelf. In theſe caſes the fiſh will be helped in all intermediate diſtances, and may riſe or ſink from any Region of the water without moving one Finn.

It were worth obſerving, what fiſhes want bladders, and if the bladders of ſeveral fiſhes are not of different ſhapes or bigneſs, and how they are in Sea-fiſhes that live in great depths, and whether any amphibious creatures have them, or any thing analogous; as the Lungs may be, or other Cavities. By an inquiry into theſe and other particulars this conjecture may be either fortified or refuted.

So far this Conjecture: In reference to which, when it was propounded to the Honourable *Robert Boyle*, he, reflecting upon the manner how a Fiſh comes to riſe or ſink in water, ſoon bethought himſelf of an Experiment probably to determine, Whether a Fiſh makes thoſe motions by conſtricting or expanding himſelf? The Experiment by him ſuggeſted was; To take a Bolthead with a wide neck, and having fill'd it almoſt full with water, to put into it ſome live fiſh of a convenient ſize, that is, the biggeſt that can be got in, as a Roch, Perch, or the like; and then to draw out the neck of the Bolthead as ſlender as you can;and to fill that alſo almoſt with water: Whereupon the fiſh lying at a certain depth in the water of the Glaſs, if upon his ſinking you perceive the water at the ſlender top does ſubſide, you may inferr, he contracts himſelf, and if,upon his riſing,the water be alſo raiſed,you may conclude,he dilates himſelf.

An Extract of a Letter, written to the Publiſher by Mr. J. L. *about poiſonous Fiſh in one of the* Bahama *Iſlands.*

Sir,

I Do herewith ſend you an account, I lately received from *New-Providence*, one of the *Bahama* Iſlands, concerning *Fiſh* there, which is as followeth;

I have not met with any rarities here worth that acceptance, though I have been diligent in inquiring after them: Of thoſe which I have heard of, this ſeems moſt remarkable to me. The Fiſh, that are here, are many of them poyſonous, bringing a great pain on their joynts who eat them, which continues ſo for ſome ſhort time, and at laſt with two or three dayes itching the pain is rubb'd off. Thoſe of the ſame ſpecies, ſize, ſhapes, colour and taſte, are one of them poyſon, the other not in the leaſt hurtful: And thoſe that are, are ſo only to *ſome* of the company. The diſtemper to Men never, that we hear of, proves mortal. Doggs and Cats ſometimes eat their laſt. In men that have once had that diſeaſe, upon the firſt eating of fiſh, though it be thoſe that are wholſom, the poiſonous ferment in their body is revived thereby, and their pain increaſed.

Thus far the ingenious perſon from whom I had this relation, who having been but a very little while upon the Iſland when he writ this, could not ſend ſo perfect an account of this odd Obſervation, as one could wiſh, or as I expect to hear from him in anſwer to ſome *Quære's* I lately ſent him by a Ship bound thither. When his Anſwer comes to my hand, if there be any thing in it, which may gratifie your curioſity, I ſhall be glad of that or any other occaſion to aſſure you, that I am, *&c.*

A Phytological Obſervation concerning Orenges and Limons, both ſeparately and in one piece produced on one and the ſame Tree at Florence: *Deſcribed by the Florentin Phyſitian* Petrus Natus, *and the deſcription lately communicated to the Publiſher.*

THis Tree was, about 30 years ſince, firſt met with in a Grove near *Florence*; having an Orenge-ſtock, which, it ſeems, was ſo grafted upon, that thence it became, in its branches, leaves, flowers and fruit, three-formed, ſome emulating Orenge, ſome Limons or Citrons, ſome partaking of both forms in one. And particularly as to the fruit, ſome of this Tree are meer Orenges, yet ſome of them of an oblong ſhape like Limons, ſome round like common Orenges, ſome between both: Others taſte like genuin Orenges, others have an Orenge ſhell, but a Limon-pulp. Moſt are of a very ſtrong ſcent and a ſhell of a very bitter taſte. But then the ſame Tree bears alſo a kind of Citron-Limon, yet not ſo many as of the former kind. And not only ſo, but it produces alſo a fruit, that is in one both Limon, Citron and Orenge, ſo as you may ſee outwardly two ſorts of fruit repreſented in one piece; one, Citron-Limon; the other, Orenge. But this fruit is ſo diverſified, that ſome of them are half Citron-limon, half Orenge; others have two thirds of Citron-limon and one of Orenge; others, the contrary: And of all theſe, ſome are oblong, ſome round, ſome bunchy; ſome ſmooth, ſome rugged; ſome ſmall, ſome of the bigneſs of two pound weight. Their fleſh is ſo diſtinguiſht, that where the Orenge-pulp ends, that of Limon begins, and on the contrary. Again, the Orenge-pulp is narrower than that of Limon; but this is tenderer than that, not ſo agreeable to the taſte as the genuin ſingle fruit. And, which is none of the leaſt remarkable things, they have either none, or very few, or empty ſeeds; concerning which the Author giveth this reaſon, that ſince this Tree is of the inſititious kind, nor can be repaired or propagated by ſeed, therefore nature was not at all ſollicitous in the generation of the ſeed.

If you inquire about the firſt original of this Tree, our Author inquires, Whether it have grown by planting Orenge and Citron-Limon ſeed together, and by uniting their young ſtems cloſe to one another; or, whether by inoculating Orenge upon a Citron-Limon ſtock? Which latter he affirms, ſaying, that by the marriage of theſe Trees, repeated for many years it was come to paſs, that by the cloſeneſs of the inoculation, whereby in length of time the mixed nature of both Trees was grown together, which the different juyces, permeating the common fibers, had for a long time nouriſhed; whence emerged at length a germen or graft perfectly retaining the nature and ſpecies of both; into whoſe different branches when ſometimes one, ſometimes both kinds of juyces did paſs, it produced on one of thoſe branches, a meer Orenge, on another, a Citron Limon, on a third, a Citron-Limon-Orenge, and even ſometimes upon one and the ſame branch all the three ſorts of this fruit together. And thus, according to *Virgil* 2. *Georgic.*

Exiit ad cœlum ramis felicibus arbos,
Miratúrque novas frondes, & non ſua poma.

An Accompt of ſome Books:

I. *Archimedis Opera*; *Apollonii Perg. Conic. Libri* 4; *Theodoſii Sphærica, methodo novâ illuſtrata, & ſuccinctè demonſtrata, ab* Iſ. Barrow, è Soc. Regia, *&c.* Londini, 1675. *in* 4o.

WHat moved the learned and worthy Author of this work to enrich the world with ſuch an Edition of theſe three Ancient Mathematicians, the Reader will find in his general Preface to *Archimedes.* What he hath performed, in ſhort is this: He hath delivered theſe three Books in a brief *Symbolical* method of Expreſſion, purſuant to the Senſe, Propoſitions, and Demonſtrations of the Ancients; unleſs where he thought fit to enlarge, and otherwiſe to demonſtrate ſome of the Propoſitions from more eaſie Principles of his own, purſuing herein his own former method, in which, ſome years ago, he publiſht an entire *Euclid* in 8o.

Beſides, this Edition contains a new Verſion of *Archimedes* his *Lemmata*, which were not formerly publiſh't with the reſt of *Archimedes*'s Works; though to be found in *Forſters* Miſcellanies, and at the end of *Joh. Alph. Borelli*'s Edition of the three latter Books of *Apollonius*'s Conicks.

The Intelligent Reader will readily acknowledge, that our Author had cauſe to find fault, as he doth, with the Cimmerian darkneſs of *Rivaltus* his Edition; who is alſo much complained of by *Mydorgius* in his Conicks, and by *Alex. Anderſon* the Scot in his Mathematical Exerciſes.

The Stationer that hath printed this, *Robert Scot*, intends to reprint the above-mention'd *Euclid*, as a part of another Volume of the Ancients, in the ſaid Method; the reſidue of which Volume may be an abridgment of *Pappus*, *Serenus*, and the three latter Books of *Apollonius*, with ſuch other ſmall Tracts of the Ancients, as have either been recover'd or reſtored by the Induſtry of this and the laſt Age: But theſe Tracts being not as yet all in readineſs for the Preſs, the Learned, that have any lucubrations thereon, or have prepar'd any of them for publike view, would much oblige the Mathematical World by imparting the ſame.

The ſame Stationer ſells likewiſe the former Treatiſes of Dr. *Barrow*, being *Optical* and *Geometrical* Lectures; to the latter whereof there are now made ſome elegant Additions *de Maximis & Minimis*.

II. Thomæ Bartholini *ACTA MEDICA & PHILOSOPHICA Hafnienſia Anni* 1673. Hafniæ, 1675. *in* 4o.

THis Collection being, in our opinion, not leſs curious and conſiderable, than that which was made by the ſame Author for the years 1671, 1672, and deſcribed *N*o. 97. of theſe Tracts; we cannot give leſs regard to it, than we did to the former.

It contains 134. partly Phyſiological, partly Medical Obſervations; among which there occurr theſe that ſeem to us remarkable above the reſt:

1. That there may be Spittings of blood rather beneficial to the Patient, than fatal, whether they be made from the Spleen, or the Lungs; foraſmuch as they may diſcharge the Veſſels of thoſe parts from a ſuperabundance of blood, and ſerve inſtead of a neceſſary venæ-ſection: Of which are here alledged divers notable Examples, accompanied with good cautions, *p.* 10, 11.

2. Of a ſtrange recovery, together with the method uſed therein, of *Chriſtian* IV. King of *Denmark*, fallen with his Horſe into a Ditch of 22 feet perpendicular depth, and remaining for a great while ſpeech- and ſenſe-leſs, *p.* 16.

3. Of the ſickneſs and death of a Duke of *Brunſwick*, cauſed by immoderate eating of raw fruits and ſallats; which bred in that Prince, beſides other ſymptoms, ſtore of worms, of which one was voided by him, 9 *Daniſh* ells long; another was found in his *colon*, after he was dead, of the length of 5 ſuch ells, *p.* 26, 28.

4. Of a Woman in *Copenhagen*, that cannot live without the daily uſe of *Opium*, which ſhe now takes to the quantity of a whole dram a day, having firſt begun with a few grains, *p.* 50.

5. Of an Obſervation made by ſome Midwives, affirming, that the Secundine of Twins is double, when the Births are of different Sexes; but ſingle, when of one and the ſame; *p.* 53.

6. Of Plants emitting a ſmell only in the night; as a ſort of *Cranes-bill*, a ſort of Dogs-roſe or Briar-buſh, *&c.* of which this probable reaſon is given by *Borrichius*, that their ſmell is not perceived, though they have it, in the day time, becauſe Sun-beams do ſo much diſſipate the *effluvia* that are ſo very ſubtile as that they cannot affect our noſtrils; whereas, after Sun-ſetting, they are condenſed, and ſo by a ſtronger and cloſer contexture make a greater impreſſion upon us; *p.* 60.

7. Of Sneeſing very beneficial in diſeaſes of the Eyes; *p.* 64.

8. That, by certain experiment, that oily ſubſtance, call'd *Sperma Ceti*, is extracted and depurated from the Brains of the greater ſort of Whales; *p* 69.

9. That Nature commonly doth compenſate the defect of one thing with ſome other thing. Of which the Author here gives Inſtance in an Artificer, who though he was quite blind, yet was able exquiſitely to carve in wood, to the admiration of the King of *Denmark*, who had him ſo vailed, that if he ſhould have any ſight, could make no uſe of it to deceive. Of which ſame man 'tis here alſo affirm'd, that by feeling he could diſcern the ſeveral kinds of wood, and colours; *p.* 78.

10. Many curious Obſervations made by D. *Steno* about incubated Eggs; *p.* 81.

11. Of a Child born, though dead, after that the mother, who had gone her full time, and was come to her travel, had been dead almoſt two dayes: And of another child, yet imperfect, that was born with the Secundine ſticking ſo cloſe to it, that the Birth could not be got out, yet by its motion was found to be alive: Which begat a controverſie, between two Prieſts at *Bergamo* in *Italy*; whereof one having baptized this Child in that condition, the Child, ſoon expiring thereupon, was not admitted to burial by another Prieſt, who denied it to have been baptized, becauſe (forſooth) the phyſical contact of the water had been hindred by the enwrapping Secundine; *p.* 92, 93.

12. That the probable reaſon, why Brothers, or Siſters, or Twins, that are far diſtant from one another, not ſeldom fall ſick of the ſmall pox at the ſame time, may be drawn from the retention of the menſtrual blood fermenting and thence breaking out, at the ſame time in both; *p.* 105.

13. Obſervations about the generation of Frogs, made by putting up Frog ſpawn in a glaſs, and ſhifting the water every day, and ſo keeping it expoſed to the Sun in the Spring; together with a remark concerning the probability of Frogs being bred in the bellies of men after the like manner; touching which here is alledged a ſtrange example of a Serving-maid, that voided at the mouth two great Toads, and four ſmall ones, and two ſmall Lizards, all alive; *p.* 108.

14. A Method for attaining the Art of Phyſick in a ſhort time, preſcribed by the Author of theſe Collections; *p.* 122.

15. Of a certain and plain remedy for the Colick, being the chawed Root of an herb that grows in the moſt Northern parts of *Norway*, called *Naput*, and there uſed with excellent ſucceſs by thoſe that work in Mines. This root is ſaid not to be unpleaſant to the taſt, taſting at firſt like a flat Reddiſh, and afterwards approaching to the taſt of *Angelica* *; *p.* 124.

* This Root ſhould be further inquired after, and brought over by thoſe that ſail into *Norway*.

16. Of a kind of Graſs, called *Oſſifragum*, growing in *Norway*, and comming forth before all other graſs, which being eaten by their Catle, emaciates them, and makes them ſick, and their back-bones protuberant, and their legs and all their bones ſo weak, that they can hardly go: Which is ſuppoſed to proceed from ſome Mercurial or other maligne ſteams that get into this graſs, and, that being eaten, affect the Nerves. The Country-people cure it with giving to ſuch Catle dryed bones broken into ſmall pieces, which the Catle very greedily devour, having firſt ground it ſmall between their teeth; whereupon follows a ſalivation, that perfectly cures them; *p.* 126, &c.

17. Obſervations about the motion of the Heart, the Auricles thereof, and the *Vena cava*, drawn from the diſſection of divers Animals, performed by D. *Steno*; who thence inferrs, 1. that the intermitted motion of the Heart taken out of thoſe creatures returns upon any vellication, made either by ſome ſolid body, as a pin,

knife, nail, *&c.* or by the ſteams or dilatation of the blood: 2. that the motion of the Heart is not in the whole ſubſtance, but in every fibre thereof, and not only in fibres entire, but alſo ſuch as want both extremes: 3. that thoſe fibres are contracted not all at once, but by parts, litle by litle, beginning from one end and ſo continuing to the other; as is ſeen in the Periſtaltique motion of the Inteſtins. Where the obſerver intimates, that hitherto nothing hath been diſcover'd to give us the true Cauſe and Manner of *Animal* motion; *p.* 141---147.

18. An Obſervation concerning the Milk of a Nurſing-mother, taſting of Wormwood from the frequent uſe of an extract of Wormwood, of which for ſome time ſhe had taken every day ſome drops in her broth, to ſtrengthen her ſtomach, weaken'd by a feaver, into which ſhe was fallen being with child; *p.* 165.

19. The controverſie about the real Inexiſtence of Volatil Salts in bodies, diſcuſſed by the Author, who aſſerts that they are only ſeparated, not produced by the fire; *p.* 174.

20. That the Fixed Salts comming from Animals are not all of the ſame nature, nor do in all things agree either with common Salt, or with the Lixiviat Salt of Plants: To prove which, many Inſtances are alledged by the Author; *p.* 184.

21. That 'tis very difficult to aſſign the reaſon, why Acid Spirits are coagulated into Salt, without any additament, and that this Salt adheres to the *outſide* of the glaſs-covers, none at all of it ſticking to the inſide of them, when they contain ſuch ſpirits; *p.* 193.

22. An odd caſe of a woman quite looſing her memory *ex retentione menſium*, but recovering it again by a cautery in the neck freeing her from that obſtruction; *p.* 196.

23. That there is no Medicin more effectual againſt hypochondriacal inflations and gripings of the belly, than the root of *Zedoaria*; and that nothing is better *puerperis, quibus lochia ceſſant*, than the ſame root pulveriſed, half a drachm to a doſe, moiſtened with two or three drops of Roſemary oyl, and taken in a little warm wine; *p.* 209.

24. Conſiderable Obſervations about Eggs in Viviparous Animals by *Steno*; *p.* 210.

25. That in a *torpedo*, (according to the ſame *Steno*) there are found Fibers, thicker than the greater ſort of Gooſe-quills, that are ſoft and white, and lying on both ſides of the fiſh perpendicularly,

ly, between the upper and lower coat,are ſeparated from one another by tranſverſe fibres, and receive manifeſt nerves, tranſverſly entring into them for motion: And that thoſe fibers take up the room that is between the lateral fins and the gills and head as far as to the region of the *Abdomen*; the foremoſt being in this poſition ſhorter than the hindmoſt: That the Animal being alive, this place was indeed ſoft to the touch,but if at the ſame time you touched it the fiſh did contract it ſelf, there was then felt a contraction at the end of your fingers with a kind of creeping pain over the whole arm, continuing for a while; though when the fiſh did not ſtir, one felt nothing, no more than when the fiſh was dead; *p.* 224.

26. Of Eggs found by the ſaid *Steno* in the Teſticles of a Mule, and of a kind of *placenta* appearing in one of them: Whence he concludes, that Mules may breed without a miracle; *p.* 230.

27. Of an Experiment ſeeming to ſhew, that Blood is made in and by the Chyle being in any part of the body, and not by the Heart alone,foraſmuch as a learned man found in the Chyle,contained in the Lacteal veſſels and there kept by a ligature for ſome hours, a red liquor moſt like to blood, inſtead of the Chyle. To which Experiment Dr. *Thomas Bartholin* offers his anſwer; *p.* 245.

28.That an Acid is connate in Animals, nor is deſtroyed by their death; witneſs the Runnet found in the folds of the ſtomachs of Calves and Lambs, which is employed in the making of Cheeſe: yet is not found in ſuch as feed upon hay, but milk; that Acid periſhing as ſoon as the young Animal is weaned. To which the Author adds, that the whole ſtomach of hoggs, when dried and cleanſed, is uſed alſo for ſeparating the Caſeous ſubſtance from the Milky; *p.* 258.

29. That the *Seed* of *Lunaria* poiſons Cattel,eating thereof, but the *Leaves* recover them: As alſo, that the Leaves of the *herba mimoſa* are poiſonous, but the Root of the ſame cures the poiſon. Worth the experimenting upon dogs and ſuch like Animals; *p.*265.

30. Of many examples of diſeaſes tranſplanted; *p.* 267. How credible, the judicious Reader may judge. Amongſt others, of a Quartan cured by putting hot bread under the Arm-pits and other junctures of the body, and giving it, when moiſten'd by ſweat, to a dogg to eat: And of the yellow Jaundies cured by making a cake of the urine of ſuch a patient and of flower, and giving it to a dogg, cat, or fox.

31. Of ſeveral remedies, commended to be highly efficacious againſt the biting of mad doggs; *p*. 274.

32. Of Worms found in pepper, reduced by them to duſt; *p*. 277.

33. Of an Ophthalmique unguent, highly extolled for curing deſparately ſore, weak and dark eyes; *viz.* ℞. *Ungu. Nihili* and of *Tutia* aä ℥ij; of Pearl, red Coral, Crabs-eyes, and *Tutia*, all prepared, aä ℈j; of Camphir gr. 6; of leaf-gold and leaf-ſilver, aä 4. in number; Mix all well, and when the Patient goes to bed, let him put into the great corner of the eye the bigneſs of a vetch, and anoint the under-ſide of the Eye-lids with the ſame; *p*. 302.

34. Several Obſervations concerning *Amber*, delivered by the Author, that the intelligent Reader upon due examination may judge, whether that ſubſtance be a Juyce of the Earth, or of a Tree; *p*. 309.

35. An Anatomical deſcription of a Parrot, diſſected chiefly for this end, that thoſe organs might be diſcover'd, whereby that Bird before other Birds emulates human Speech, *p*. 314; too long to be tranſcribed hither.

36. An Accompt of all the Muſcles in an *Eagle*, diſſected by the Learned *Steno*; where occurr many conſiderable remarks relating to the general doctrine of Muſcles, *p*. 320. to 345.

37. Of an iron dart ſtuck in the brain of a *Boruſſian* Knight fourteen years, that came at laſt out of the throat by ſuppuration.

III. *The Epitome of the whole Art of Husbandry, with Additions of New Experiments thereto belonging: Written by* J.B.*Gent.* *in* 8o. London, 1675.

THE moſt Ingenious Maſter of Agriculture is bold to require for perfection in Husbandry a great meaſure of knowledge in Philoſophy: *Nam qui ſe in hac ſcientia perfectum volet profiteri, ſit oportet rerum naturæ ſagaciſſimus, declinationum mundi non ignarus; ut exploratum habeat, quid cuique plagæ conveniat, quid repugnet*, &c. ſaith *Colum. Præf.*

It is but half an Age, or in freſh memory, ſince Improvements in Husbandry began to have any name, or to bear any credit in *England*. Sir *Hugh Plât* had a long and tedious task, and ſpent many years in Pleas, Defences, Apologies, Sollicitations, Printing and

Reprinting many Tracts, before the Husbandry would ſtirr. But by Importunities and Perſeverance at laſt he prevailed ſo farr, that in moſt County's they were convinced, and began to ſee, and taſte, and enjoy the publique benefit. And after our diſmal Wars broke out, in the intervals, ſome were by neceſſity conſtrain'd to ſeek out all advantages they could hear of, and ſome had great opportunities for any hopeful or famous Eſſays. And thus, on a ſudden, the humor and ſpirit of a People is alter'd. Books of Husbandry are ſold off as faſt as the Preſs can print them. Sir *Hugh Plats Garden*, and *Jewel Houſe*; *Hartlibs Legacy*, *Bees*, a part, and *Silkworms*; *Gab. Plats*; Sir *Rich. Weſtons Husbandry of Flanders*; Capt. *Blith*; Any thing that ſeem'd new and probable: And all our Old Georgical Writers are called to a New accompt. *Tuſſers* old rimes are fetch't out of the grave and duſt; and happy he, who had gotten *Surflets Country-farm*, largely extracted out of *Charles Stevens*, *John Liebault*, *Serres*, *Vinet*, all French; *Albyterio* the Spaniard, and *Grylli* the Italian; all revived, and enlarged by *Markham*. The next, in old eſteem, was *Googes* noble *Heresbachius*, and many Writers of Gardens, Orchards and Bees. But of *Bees* never any ſo accurately and philoſophically as Learned *Samuel Purchas* in his *Theater* of *Political Flying Inſects*, eſpecially *Bees*: Where we may ſee the moſt diligent, both of the ancient and modern, many times over-refuted by ſatisfying Experiments and ocular demonſtrations.

Of theſe, *Hartlibs Legacy* and Sir *Rich. Weſtons Husbandry* of *Brabant*, carried the greateſt eſteem and prevalency in theſe days; each of them ſoon comming abroad in a fourth Edition, with amendments and additions. By all which helps and improvements, the Soyl and Agriculture of *England* was very much enriched, above what it was in the Reign of Queen *Elizabeth*.

Since his Majeſties Return, the Judicious have deſired to ſee the ſeveral kinds and improvements in Husbandry, as now they ſucceed beſt in the ſeveral parts of *England*, chiefly from the remoteſt parts, Eaſt and Weſt, South and North; from the Champian Counties, and the Vale of *Eſom*, from *Wales* and all the Borders of *Wales*; hoping alſo to receive, in time, a good accompt from *Scotland*, *Ireland*, and the Northern parts of *America*.

For, 'tis obſerv'd, that there is great variety of Soyls in *England*, differing kinds of Agriculture, and that our very Cattel, Oxen, Cows, Sheep, Swine, yea and (if well heeded) our Horſes, do differ, in every of our Provinces, in ſhape, colour, or ſome other property.

And firſt, the Public is obliged to *J. B.* Gent. for the *Syſtem* or *Myſtery of Husbandry*; and to Mr. *Rea* for many conſiderable Experiments: One of them (as I take it) from the Borders of *Wales.*

For the foregoing reaſons, I ſhall extract our Author more punctually, in ſuch order as it lyes (though not in perfect order) referring to his pages; hoping, that he will not be diſcouraged from publiſhing his *Second part of New Experiments*, which may ſeem in a manner promiſed *to the Reader.* His language is very plain, not uneaſie for the honeſt Husbandman. The Book compriſeth many of the moſt neceſſary directions for Improvements: Some of them, indeed, to be found in other Tracts, by us formerly mention'd; but moſt of them confirmed by the Authors own diligent Obſervations and Experience, as the *Epiſtle* ſaith; and many of them, which are for peculiar uſes, firſt diſcover'd by his own Eſſays.

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* *To mow corn*, is to place the corn orderly in mowes in the barn, or on ſtacks.

† To *ted hay*, is to ſpread it in the Sun, after 'tis mowed.

2. The ordering of Flower-gardens, and Kitchin-gardens, &c. from p.48, to 64. Bees, 66.

3. To keep beaſts, and cattel, 67. To buy fat catel, or lean. To rear calves, and geld them, 67. &c. what cattel may go together in one paſture, 71. Of ſwine, 72. Of horſes, 73.

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7. The young Gentleman's Heroic Exerciſe; or, The perfection of Horſmanſhip, drawn from Nature, Art, and the practiſe of Riding, 204. In which he is more copious and punctual, than I have ſeen in any other Treatiſe pretending to Agriculture.

8. The Authors Experiences for the beſt way of planting Orchards for Apples, Pears, Plums, Cherries, &c. 240.

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* that is, after being plunged and tired in a mire or bogue.

2. His Experiences for the time, and beſt way of taking, ordering, feeding, breeding, chooſing, teaching, and curing of Singing-birds; for Cages, Rooms, or Aviaryes; for Cloſes, Parks, Hedges,

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3. He notes it pag 136, to be very obſervable, that no Animal beſides Birds, can learn, or, by any means, be taught to ſpeak, or to imitate a mans voice: *We may add*, Nor yet to imitate, and much leſs to emulate Mans ſinging, or any muſic made by man; As our Author records a hot and continued contention between a Gentleman of his Acquaintance, and a Nightingale free in a Grove, for the victory in ſinging, 79; which ſtory ſupports the credit of the *old contention* between the Nightingale and the Luteniſt, celebrated in the Elegant Poeſie of *Famianus Strada*. And the famous Lord *Peyreske* gave his vote, (as *Gaſſendus* tells us) for the muſic of Birds above any Harmony that man can make. And the muſic of Birds is then ſweeteſt, when they are free, and at full liberty, (and cannot complain of reſtraint) in a Grove; and where they can chooſe their Conſorts, and the places, and poſtures of approach or diſtance, and with choice of Echoes, as our Author noted in the Nightingals and Wood-larks, two Nightingals to two Wood larks, 79. And we have not ſeen any Animals more fondly loving to Mankind, than Birds. And it ſeems eaſie to tame Birds to reſort to what Groves we pleaſe, (and ſome have performed it;) there to build their Neſts, and to breed up their young, only being furniſhed with fit materials at hand: And for ſuch as cannot bear our Winter, or our Summer, they may in ſeaſon be invited into clean encloſures. And when at liberty, they may be confined to one Grove or Thicket adorned with fragrant and health-breathing Trees; and affrighted from fruitful Groves, where they are hurtful; though

neither be many furlongs diſtant from each other, nor from the Lords Manſion.

Neither is there ſcarce any Animal ſo fierce, but may be tamed by Muſic, or by ſome other way of *Cicuration*; moſt of them for Human uſe. For proof of which, I referr to two ingenuous Chapters, the 8*th* chapt. of *Muſic*, and the 11*th* of *The Art of taming wild Beaſts*, in the brief Treatiſe of *Human Induſtry*, or *Of Human Wit*; which deſerves to be corrected, and reprinted, and continually augmented, as Arts grow on; ſo that this Treatiſe may grow on, as Dictionaries have grown to more perfection. *Theſe* are for words and diſcourſes; *That* for Realities, Arts, and Sciences.

Since the moſt furious of Mankind, and the fierceſt of other Animals may be tam'd by Muſic (as is there inſtanced *chap.* 8.) and ſince the Crocodile, Serpents, Fiſhes, and Sea-monſters may be made fond and ſerviceable to Mankind, (as is copiouſly there inſtanced *chap.* 11.) we may thence hope and preſume, that the *Cicuration* of all Animals in the Groves and Woods, in the Wilderneſs, Seas and Rivers, may hereafter come into more eſteem, and into more general uſe and practiſe, than now it is; and more compleatly to aſſert Mans dominion over this whole Globe, than hitherto is attained.

And that this diſcipline is not a very Novelty, but (of old) belonging to Agriculture, according to the ſtaunch method of learned *Varro*, when he was 80 years old; we have his teſtimony *l.* 3. *de re ruſtica, c.* 13. *Quintus Orphea vocari juſſit, qui cùm eo veniſſet cum ſtolâ, & citharâ, & cantare eſſet juſſus, buccinam inflavit, ubi tanta circumfluxit nos cervorum, aprorum, & cæterarum quadrupedum multitudo, ut non minus formoſum mihi viſum ſit ſpectaculum, quàm in circo maximo ædilium non ſine Africanis beſtiis cùm fiunt venationes.*

And *l.* 3. *c.* 17. he gives us the like teſtimony of the obedience and attention of Fiſhes to the Pipe. *Quos proinde piſces* (ſaith the Interlocutor) *ut ſacri ſint, ac ſanctiores, quàm illi in Lydiâ, quos ſacrificanti tibi, Varro, ad tibicinem Græcum gregatim veniſſe dicebas ad extremum littus, atque aram; quòd eos capere auderet nemo. ----Sic hos piſces nemo cocus in jus vocare audet.*

'Tis not now for our credit, to looſe any ground or footing of the Dominion, which our Anceſtors long ſince acquired. 'Tis a noble Work, and work enough for ſome ages to come. *Statius Sylvarum l.* 2. *Leo manſuetus Imp.* reports the tameneſs and couragious ſerviceableneſs of *Domitians* huge Lion:

Quid quod abire domo, rurſúſque in clauſtra reverti
Suetus, & à captâ jam ſponte recedere prædâ,
Inſertáſque manus læto dimittere morſu, &c.

Our American Colonies are concern'd for the one, and for the other; for the taming of Man and Beaſts; both the Savages, and the Wilderneſſes. And ſome have a peculiar faculty and promptneſs for both. But to tame the wild and ſavage Man, is the hardeſt task, as *Xenophon* ſaith, παντὶ ζώῳ ῥᾴδιον ἄρχειν, ἢ ἀνθρώπῳ; and as *Seneca*, *Nullum eſt animal homine moroſius, aut majore arte tractandum.* Yet we hear, That the Savages in many parts, for a good guſt in dreſſing the Veniſon which they have taken, and for other uncoſtly gratifications, will prove better hunters, then our beſt Kennels; and very ſerviceable upon the boldeſt and moſt difficult adventures on the Land, or in the Water. And as thoſe Singing-birds (in the opinion of ſome) are tamed to beſt purpoſe, which are free, and at call, in the Groves; ſo alſo are thoſe Savages tamed beſt, who taſte the trueſt freedom in Civil Government, and Civil Manners, in good Diſcipline, and in a life of agreeable delights, and reaſonable ſatisfaction. This were to retrive the prudence of the old Romans, whilſt they raiſed their Empire: Then they reclaimed more Barbarians by their ingenious Civilities, than they ſubdued by oppreſſion and force, as is gravely teſtified by *Saluſt.* But, when they became unnatural by their luxury and diviſions, then they ſuffered the Inundations, and fell under the feet of Barbarians.

And no Treat can be more ſafe, innocent, and effectual for an unreclaim'd people, to reduce them to apply their ears to *the beſt documents*, than Muſic; Sometimes to make their Wilderneſs eccho with the Trumpet, Cornet, and loudeſt Muſick; Sometimes to cheer up all with the merry Flagellate, Flute, Fife, and Pipe: And when the game is ended, to *ſweeten* all with the Lute, Harps, and Violins;

Omne tulit punctum, qui miſcuit utile dulci.

A Propoſal to Noblemen, Gentlemen and others, who are willing to ſubſcribe towards Dr. Moriſon's *New* Univerſal Herbal, *ordering* Plants *according to a new and true Method, never publiſhed heretofore.*

WHereas *Robert Moriſon* Dr. of Phyſick, Botanick to his Majeſty, and Profeſſor of that Science in the Univerſity of *Oxford*, hath, by his aſſiduous and long obſervation, diſcover'd a more eaſie and Scientifical Method of knowing *Plants* out of the *Book of Nature*, according to the different forms of their *Flowers*, *Seeds*, and *Seed-pods*, than hath ever yet been publiſhed; whereof he hath lately (to the great ſatisfaction of the Learned, both at home and abroad) given an *Eſſay* in one of the moſt difficult *Claſſes*: And being now deſirous, for the advancing and facilitating that part of *Natural Hiſtory*, which hath hitherto been ſo tedious and diſcouraging to Students of that Science, for the honor of this our famous Iſland, and for the Increaſe of Learning, chiefly in the Univerſities of *Oxford* and *Cambridge*, with all poſſible ſpeed to finiſh and put out the whole Work; which, by reaſon of the exceſſive charge of *Deſigning*, *Graving*, and *Printing*, he is not able to perform without the aſſiſtance of ſuch Noblemen and Gentlemen, as are deſirous to further and encourage this great Work: He therefore doth hereby engage to Noblemen and Gentlemen, or others, who ſhall be pleaſed to favour him with one Plate of five pounds, that an Honourable memorial ſhall be made of them, by engraving their Coat of Arms on their reſpective Plates (as is already done to others in the foremention'd Eſſay, as likewiſe in an hundred Plates and upward, of the five Sections now in hand;) and that a Book ſhall be deliver'd to each of them conſiſting of the ſaid five compleat Sections, making 116 Plates cut in *Taille douce*, containing 1450 Plants, together with their Doctrine, according to his new and truly modelled Method: And at the paying down their five pounds, each one ſhall receive one of his Specimens *Umbellarum*, &c. together with a Receipt under the Propoſer's hand, obliging him to furniſh to each Subſcriber or his Aſſigns the aforeſaid five Sections complete, with their Doctrine, they furniſhing him with their Coat of Arms blazoned, to be engraven under their reſpective Coats, And we, whoſe Names are hereto ſubſcribed, do hereby engage our ſelves to the ſaid *Robert Moriſon*, to pay, upon demand, towards this Work, each of us, the ſum of five pounds for one Plate.

The Author finding, that he hath employed almoſt three years in engraving 108 *Plates, the firſt two years carrying on the Work but ſlowly, and that partly for want of good and diligent Gravers; and now this laſt year, finding ſome Strangers both diligent and able, who joyned with ſome Artiſts of our own, we now want only the encouragement of Subſcribers, for paying the Painters and Gravers, to finiſh the whole Work in as ſhort a time as can be poſſibly allowed: Which makes us earneſtly wiſh, that other Noblemen and Gentlemen, who have not ſubſcribed as yet, would follow the Example of thoſe that have done ſo and paid; and their reſpective Coats ſhall be engraved with the others.*

Beſides, the Propoſer herewith ſignifies to all thoſe that have ſubſcribed to this Work, and have paid their mony, that though he hath already 108 *Plates (of the five* Sections *to be deliver'd) engraven, yet he wants the payment of* 20 *Plates from ſo many Subſcribers; and that he goes on with the Gravers; but that thoſe who have ſubſcribed long ago, and have not as yet paid, are the cauſe why the five Sections are not finiſh't ere now: Wherefore they are deſired to pay in their mony with all ſpeed, (as others have done,) according to their Subſcriptions.*

The five Sections are theſe.

PRima *Sectio continet Scandentes Bacciferas Edules & non Edules; Scandentes Lacteſcentes Campanulatas ſeu Convolvulos; Scandentes Pomiferas Edules & Purgantes. Componit* Tabb. *6.*

Secunda *continet Legumina ſeu Siliquoſas Papilionaceas Bicapſulares, & legumina Trifoliata ſeu Trifolia leguminoſa;* Tabulis 20.

Tertia *continet Siliquoſas & Siliculoſas Tetrapetales Bicapſulares;* Tabb. 24

Quarta *continet Tricapſulares Hexapetalas;* Tabulis 28.

Quinta *continet Tricapſulares Lacteſcentes Campanulatas, Corniculatas & Galeatas; Tricapſulares Pentapetalas; Bicapſulares Monopetalas; & Bicapſulares cum rictu anteriùs, ſine calcari & cum calcari, poſteriùs; Pentapetalas quinque-capſulares; Pentapetalas ſeminibus orbiculariter cingentibus ſtilum nutritivum; Pentapetalas Unicapſulares; Plantas flore herbaceo præditas ſemine triquetro, & ſemine lucido nigro;* Tabulis 34.

Errata left uncorrected in *Numb.* 113.

P.302. l.43. dele *colon* after *fruit*, and place it after, *the Sieur le Gendre*; and then read on thus, *He, and the French Gardiner.* p.303. l.22. r. *in all perfection, all the year.* p.304. l.6. inſtead of *further*, read, *Here I am plunged. Our Author, it ſeems, having,* &c. ibid. l.36. r. *reprinted* 1655.

London, Printed for *J. Martyn* Printer to the *Royal Society*. 1675.

Numb. 115.

PHILOSOPHICAL TRANSACTIONS.

June 21. 1675.

The CONTENTS.

A New Eſſay-Inſtrument invented and deſcribed by the Honourable Robert Boyle, *together with the Uſes thereof: The Diſcourſe conſiſts of* three *parts; The* firſt *ſhews the Occaſion of making it, and the Hydroſtatical Principle 'tis founded on; The* ſecond *deſcribes the Conſtruction of the Inſtrument; The* third *repreſents the Uſes, which, as relating to Metals, are;* 1. *To diſcover, whether a propoſed* Guiny *be true or counterfait.* 2. *To examine divers other Gold-coyns, and particularly* half-Guinys. 3 *To examine the new Engliſh* Crown-pieces *of* Silver. 4. *To eſtimate the goodneſs of* Tin *and* Pewter. 5. *To eſtimate the* Alloys *of Gold and Silver, and ſome other Metallin mixtures.*

The firſt Section.

Shewing the Occaſion of making this new Eſſay-Inſtrument, together with the Hydroſtatical Principle 'tis founded on.

TO give you *now* a more explicite and particular Account, than I had *then* time to do, of the Inſtrument which you ſaw tried at the Royal Society, I ſhall inform you, on what Grounds I deviſ'd it, and then annex ſome Obſervations about the Fabrick and the Uſes of it.

You may remember, that many years ago I ſhew'd you a little glaſs-Inſtrument, conſiſting of a bubble, furniſhed with a long and ſlender ſtem, which was to be put into ſeveral Liquors, to compare and eſtimate their ſpecifick Gravities, and which I made uſe of to ſome purpoſes, for which it is not, that I know, as yet employed. But afterwards conſidering this little Inſtrument ſomewhat more attentively, I thought the application of it might eaſily be as 'twere inverted, and that, whereas 'twas employed but to diſcover the differing Gravities of ſeveral Liquors, by its various degrees of Immerſion in them, it might be employed to diſcover the ſpecifick Gravities of ſeveral appended Solids, by its being more or leſs depreſſed by them in the ſame Liquor. For 'tis clearly deducible from the Grounds of the Hydroſtaticks, that any ſolid Body heavier than Water, looſes in the Water as much of the weight it had in the Air, as Water of equal bulk to the immerſed Solid would weigh in the Air; and conſequently, ſince Gold is by far the moſt ponderous of Metals, a piece of Gold and one of equal weight of Copper, Braſs, or any other Metal, being propoſed, the Gold muſt be leſs in bulk, than the Copper or Braſs. And by this means if both of them be weighed in the Water, the Gold muſt looſe in that Liquor leſs of its former weight than the Braſs or Copper; becauſe the baſer metal as well as the Gold, grows higher by the weight of a bulk of Water equal to it; and the baſer metal being the more voluminous, the Correſpondent Water muſt weigh more than that which is equal to the Gold.

This Hydroſtatical Principle may be evidently proved from what has been demonſtrated in a *Mathematical* way, by the moſt ſubtile Archimedes *de Inſidentibus humido*, and his Commentators; and thoſe that are either unacquainted with, or diſtruſtful of ſuch Ratiocinations, may find the Principle made out in a *Phyſical* and Experimental way in another Paper. Whence I concluded, that I might ſafely infer, that the floating Inſtrument abovementioned would be made to ſink deeper by an ounce, for inſtance of Gold hanging at it under water, then by an ounce of Braſs or any other Metal, which by reaſon of its greater bulk than Gold, looſing more of its weight by the Immerſion, muſt needs retain leſs, and ſo have leſs power to depreſs the Inſtrument 'twas faſtned to. Which Concluſion, you will eaſily believe the event did upon trial exactly juſtifie; and I preſume you will as little doubt, that the Concluſion will

V. Hydroſt. Paradox.

alſo hold (though the diſparity be not ſo great and conſpicuous) in reference to other Metals, as Lead and Tinn, that differ in ſpecifick Gravity.

To give at once an Inſtance of the Truth and Uſe of this Notion, I was induced to fit the Inſtrument, that was grounded on it, for the examination of Guinys, which are by far the moſt uſual Gold-Coins that paſs in *England*. And though the exactneſs and diligence of our Ingenious Friend Mr. *Slingsby* allows us to expect, that no injury that care and skill can prevent ſhall be done to that Coin, yet becauſe ſome Goldſmiths and others retain fears of being deceived by the fraudulent and ſubtile Artifices of falſe Coiners, I thought it might not be amiſs to furniſh them with an eaſie and practical way of diſtinguiſhing a true Guiny from a counterfeit. And though I hope I need not tell you, that I look not upon the Inſtrument I ſhew'd you at *Greſham Colledge*, as capable of examining Gold and other Metals with as much nicety as by other Methods one may Hydroſtatically do; yet this little Trifle may on ſome occaſions be preferable, ſince the Inſtrument, which is not dear, being once fitted, there is no need to have either exact Scales, or skill in Hydroſtaticks, or any knowledge of Arithmetick, and yet the difference of a true Guiny from a counterfeit will not only be ſufficiently, but conſpicuouſly, made to appear, and the operation will be much ſooner performed than in the other way, and very much ſooner and cheaper than by the Methods commonly employed by Goldſmiths and Refiners. For, in our way the Coin is not defac'd or injur'd by cutting, punching, &c; nor is there any need of Touchſtones, or Aqua fortis, and yet the tryal is ſo quickly made, that perhaps near twenty Guinys may be examined one by one, in about a quarter of an hour: I ſay, *one by one*, becauſe that if the Inſtrument be deſigned and fitted for ſuch a purpoſe, *many* Guinys may be tried *at once*. But whether the Goldſmiths will make uſe of this way, I leave them to determine; it being ſufficient for me, *to* have gratified ſuch *Virtuoſi*, eſpecially the Diſciples of Vulcan, as have given occaſion to expect this Trifle will be acceptable unto them; and *to* add this Inſtance to thoſe I have elſewhere given by way of proof, That by

the

the knowledge of Cauſes men may employ exceedingly differing means to produce the ſame Effects (as, in our Caſe, Gold, that Chymiſts and Say-maſters are fain to examine by the fire, we examine by water) *and* that Philoſophical Truths, and particularly Hydroſtatical ones, are not lightly to be deſpiſed as airy and empty Speculations, ſince they may be ſometimes applied to practical Uſes, to which at firſt ſight they ſeem to have no relation at all.

The ſecond Section.

Deſcribing the Conſtruction of this Inſtrument.

I Proceed now to the *Conſtruction* of the Inſtrument it ſelf, in which are to be conſider'd the *Matter* and the *Form*.

The *Matter* may be Glaſs, Copper, Silver, or almoſt any other ſolid Body, that is, or may be made, fit to float in the water, with a Guiny hanging at it, and of a Texture cloſe enough to keep out the water. For, if any of *that* ſhould, by ſoaking or otherwiſe, get in, it may alter the Gravity of the Inſtrument, and render it deceitful.

My firſt Trials were made with bubbles of Glaſs, furniſh'd with ſlender ſtems, Hermetically ſealed at the top; and theſe, when one can procure an Artificer that can blow them well, are both the *gentileſt* and the *cheapeſt*, and for ſome of the Uſes, that may hereafter be mentioned, they are almoſt the *only* ones that can be fitly imployed. But, beſides that 'tis not eaſie to meet with Artificers that can give Glaſs the right bigneſs and ſhape, thoſe, as all other Inſtruments of glaſs, being very frail and ſubject to be broken; the ſafeſt way and more durable is, to make them of ſome Metal, eſpecially either Copper or Silver, (of which the former is far more cheap, and the other more gentile, but either will ſerve well;) in regard they are leſs heavy, and, being more ſtiff, will maintain their figure better than Gold or Lead. Copper and Silver will alſo ſuffer themſelves to be beaten into plates thin and yet ſtrong enough, and are not ſo ſubject to ruſt as Iron and Steel. But in ſome caſes, eſpecially in want of metallin Inſtruments, we may make uſe of well ſeaſon'd wood, laid over with ſome China Varniſh, or ſome other that is very cloſe.

As to the *Form* of the Inſtrument, it conſiſts of three parts; the Ball or Globulous part; the Stem or Pipe; and that which holds the Coin.

The Ball or round part conſiſts of two thin concave Plates of Copper, or other Metal, exactly ſoder'd together in the middle; and at the diſtanteſt parts from the Commiſſure there ought to be left two oppoſite holes, one in each Plate, for the two other parts of the Inſtrument. This middle part, though for brevity ſake we name it the Ball, ſhould not be exactly round, but, for the Conveniency of ſwimming, of an almoſt Elliptical or Oval Form, or rather ſomewhat inclining to that of a very deep double Convex Glaſs; or it may be of any other ſhape that ſhall be found fitteſt to make the Inſtrument keep its erect poſture ſteadily in the water. The *bigneſs* of it muſt be ſomewhat greater or leſs, as the Plate is made thicker or thinner: But the general Rule for its Capacity is, that it ſhould contain as much Air, as may ſerve to keep the whole Inſtrument, when furniſht, if need be, with its ballaſt and clog'd with a Guiny, from ſinking beneath the top of the Stem, which *Stem* is the next part to be taken notice of.

If the Inſtrument be to have its Ballaſt (if I may ſo call it) *within* its Cavity, it will be convenient, if not neceſſary, that it ſhould be hollow, like a Pipe, exactly cloſed at the upper end; but where the Ballaſt is to be placed *without*, the Pipe ſhould be made ſolid, as of a piece of Wire, or a little Cylinder of ſome lighter matter that will not ſoak-in water: But, whether it be hollow or no, it ought to be made very ſlender, that the different depreſſions of the Inſtrument in the water may be the more notable. And for the ſame reaſon it ought not to be too ſhort, eſpecially if it be to be applied to other uſes than the examining of Guinys.

The Inſtrument, I moſt uſe meerly for *Guinys*, hath its Ball about the bigneſs of a ſmall Hen-egg or rather leſs, and the Pipe between four and five Inches long, being ſoder'd-on to the Ball at the uppermoſt of the two holes abovementioned; at the undermoſt of which is inſerted and ſoder'd the undermoſt part of the Inſtrument, which I call the Screw, or the Stirrup, becauſe ſometimes 'tis made of a piece of wire, that a little beneath the bottom of the Ball is bent round, ſo as to ſtand horizontally, that, the Guiny being laid on it, it may be ſupported by it, as the foot is by a ſtirrup; and in this way a piece of Coin is the moſt readily put on and taken off. But the more ſecure way is, inſtead of the bent wire, to imploy a very ſhort piece of Braſs with a broad ſlit in it, capable of receiving the edge of the Guiny, which with one turn or two of a ſmall and ſlight lateral ſcrew may be kept faſt in it,and readily,the operation being ended,taken out again.

If you deſire to examine not only Guinys, but greater Gold-Coins and Metalline mixtures, it would be convenient, that the undermoſt ſtem and the ſcrew be made by it ſelf,that it may be at pleaſure thruſt upon the ſtem and taken off again. For by this means, if the ball of the Inſtrument be made large enough, you may have room to put on,as occaſion ſhall require, one, two or three flat and round pieces of Copper, Lead, &c. with each of them a hole in the middle, fitted to the ſize of the ſtem, ſo that they may be put on as near the lower part of the ball,as you think fit,and then the ſcrew may be thruſt on after them,not only to take hold of the Coin or Metalline mixture to be examined, but to ſupport the plate, if need be; and by a variety of ſuch plates, which may be taken off and put on at pleaſure, the ſame Inſtrument, if (as I was ſaying) the ball be competently large,may be adjuſted ſometimes to a Guiny, ſometimes to a Coin of Gold or Silver, or to a Metalline mixture twice or thrice as heavy as a Guiny in the Air.

The Inſtrument being made of a convenient bigneſs and ſhape; to adjuſt it for the uſe of examining Guinys, you muſt by the help of the ſtirrup or ſcrew, hang, at the bottom of it, a piece of that Coin which you know to be genuine,and, having carefully ſtopt the Orifice of the ſtem, if it be a pipe,(that no water may get in at it,) immerſe the Inſtrument leaſurely and perpendicularly into a Veſſel ful of clean water, till it be depreſt almoſt to the top of the ſtem, and then letting it alone, if being ſetled it continue in the ſame ſtation and poſture, your work is done;but if it ſink quite under water, you muſt lighten it either with a file, or by ſcraping or grating off a little of the ballaſt-plate abovementioned; or, if you have put any weight into the Cavity to poiſe it, by taking out ſome of that, till you have made it light enough: But if, when you leave the Inſtrument to it ſelf, it emerge, you muſt then add a little weight to it, either by putting into the ſtem, if it be hollow, ſome duſt-ſhot, filings of Lead, or ſome other minute and heavy Body, or elſe by putting on the ſhort ſtem abovementioned, that comes out beneath the ball, a flat, round, and perforated piece of Lead of weight, ſufficient to enable the Guiny to depreſs the weight as low as 'tis deſired: Which being done, a mark is to be made juſt at the place where the ſurface of the water touches the ſtem, and then taking out your Inſtrument, ſubſtitute in the place of your Guiny a little round plate of Braſs, of the ſame weight, or a grain or two heavier, in the Air; and putting the Inſtrument into the water as before, ſuffer it to ſettle, and make another mark at the interſection of the ſtem and the Horizontal ſurface of the Water.

About this way of adjuſting our Inſtrument, the following Particulars may be noted:

If a Screw be employed to ſuſtain the Guiny, the Coin ought to be ſo placed, that one half, according to the eſtimate of the Eye, may be on the right hand, and the other on the left hand of the ſcrew; that the Inſtrument being depreſſed may continue in an erected poſture, and not ſwerve to an inclin'd.

Though when the ſtem is hollow, and the Inſtrument too light, it may ſeem the better to add Quickſilver than any other weight, becauſe of its fluidneſs, and great ſpecifick gravity; yet, unleſs the Inſtrument be of glaſs, 'tis not ſafe to imploy Mercury, becauſe 'tis apt to diſſolve the ſoder.

If the Marks be made of a white Colour, they will be ſo much the more conſpicuous: And theſe marks may be made, if the pipe be hollow, by making round Impreſſions with a ſmall file, and incompaſſing them with little Circles of fine wire of Silver, Gold, &c. And, if the ſtem be ſolid, it may then be either quite perforated at the requiſite places, and have the holes filled with chawed Maſtic, or ſome ſuch white ſubſtance that diſſolves not in water, or elſe have little holes, that pierce not quite through, ſtuck into it, and theſe may likewiſe be filled with the ſame ſubſtance, which, if further diſtinction be deſired, may have ſome parts of it differingly coloured before they be employ'd.

Twill be requiſite, to imploy in adjuſting the Inſtrument one of the heavieſt Guinys you can get, to depreſs the Inſtrument as low as 'tis like to be by any piece of that Coin, leaſt otherwiſe meeting with one conſiderably heavier than that you made uſe of, the Inſtrument may be thereby made to ſink to the very bottom of the water.

The Reaſon why 'tis above preſcribed, that the Inſtrument be immerſed *almoſt*, not quite, to the *Apex* of the ſtem, is, becauſe I have found, that *Guinys* are not all preciſely of the ſame weight, nor all waters neither; and therefore 'tis ſafeſt, to leave a ſmall part of the ſtem, as an eighth, or, in longer Inſtruments, a quarter of an Inch, extant above the water, that we may ſecure the Inſtrument from being by a heavier Guiny made quite to ſink.

I foreſee, it may be hence objected, that theſe Contingencies may make our Inſtrument uſeleſs: To which it is not difficult to anſwer, that, though ſome *Guinys* weigh a grain or two more than others, it is not that will fruſtrate the uſe of our Inſtrument, and leſs will the difference of our waters do it, ſince (as I have obſerved in another Paper, where I mention ſome Trials of this kind) having examined and compared together the ſpecifick gravities of (common) Pump-water, Thames-water, and Rain-water, I found the difference far more inconſiderable than one would have thought, and conſequently unable to keep Hydroſtatical Trials of Metals from being accurate enough for practice, and more exact than thoſe troubleſome and chargeable ones that are commonly relied on.

Theſe Anſwers to the recited Objections, will be made good by this, That 'tis not a doubtful or inconſiderable difference, that appears upon the differing depreſſions of the Inſtrument, that are made by a true Guiny, and by a piece of Braſs or of Copper, of the ſame weight with it in the Air. For, in the Inſtrument lately deſcrib'd, though ſmaller than moſt that I have imployed, the diſtance betwixt the mark to which the Gold, and that to which the other Metal, though Copper, depreſſed it, was, by meaſure, about an Inch and three quarters ; ſo that it is not every ſmall variation of Circumſtances that can make it doubtful to him that employs our Inſtrument, whether a Guiny be true or counterfeit.

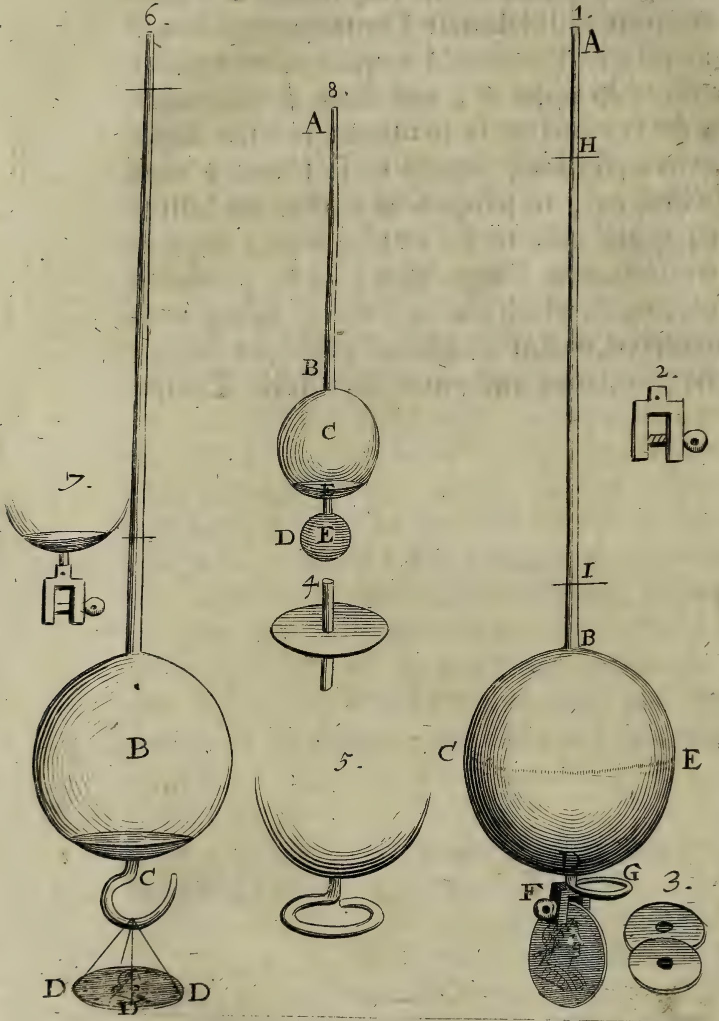
But Philoſophical Candor forbids me to conceal, that there may, (though 'tis like there very ſeldom will,) happen a caſe, wherein, though the Principle, our Inſtrument is framed on, will hold good, yet the practical Application may be unſecure. For, if a Falſifier of money have the skill, by waſhing or otherwiſe, to take off much of the quantity or ſubſtance of the Guiny without altering or impairing either the figure or the ſtamp, the piece of Coin will not be able to depreſs our Inſtrument to the uſual mark, and may thereby make it be judg'd *counterfeit*, when 'tis indeed but *too light*.

But on this occaſion 'tis to be conſider'd, that neither the Touchſtone, nor Aqua Fortis, nor Antimony, nor the Cupel, can ſhew us, whether a piece of Coin propos'd have its juſt weight, but only, whether the Metal be true Gold : And therefore our Inſtrument need not pretend to do more than diſcover the Genuineſs of the Metal; but whether the Coin have the juſt weight the Law requires, is to be judged by the Ballance; as each ſingle piece is wont to be in moſt of the Gold-Coins of *Europe*, and is in *England* in reference to *Angels* and *twenty ſhilling Peices*, and all the other Coins of *Broad Gold*, as they are now called. And yet it may be further conſider'd, that our Inſtrument does more than it need pretend to: For, without a pair of Scales, it preſently ſhews, that the propos'd Guiny, if it be not counterfeit, is otherwiſe abuſed ; and though it does not clearly determine, whether that likewiſe proceed from the want of ſpecifick Gravity in the Metal, or from the Coins having been waſhed or otherwiſe fraudulently leſſen'd ; yet it *probably* reſolves the doubt, becauſe, if the want of weight appear by the Inſtrument to be very great, as it uſually does where the piece has been robbed of ſome of its ſubſtance, (eſpecially if it be ſo much as is reported of ſome *Guinies*, that of late are ſaid to have been found wanting to the value of near four ſhillings ;) 'tis a ſtrong Preſumption, that 'tis rather waſhed, &c. than counterfeited. For, men will ſcarce venture their Lives to ſteal but three or four grains from a true Guiny, and much leſs from a falſe one. And they that counterfeit, are not wont to be ſo ſparing as to make their Coins too light. However, our Inſtrument will in theſe Caſes be ſure to prompt him that uſes it to employ the Ballance, which will preſently aſſiſt him to reſolve his doubt. For, if the ſuſpected Coin have in the Air its due weight, 'twill argue, that the great lightneſs of it in the water proceeds from the Metals not being true Gold, or, at leaſt, of its not being of the requiſite fineneſs ; and, if it want much of its due weight in the Air, 'tis very probable, for the Reaſon above-intimated, that 'tis waſh'd, &c. rather, than of another metal than Gold ; and however may be lawfully refuſed to be taken in payments, and perhaps afford a juſt ground of queſtioning him that utters it. And if one would, for curioſity, be further ſatisfied, whether the Metal be Gold or no, one may add to the Coin (as will be hereafter taught) as much ſterling-Gold, as will make it, in the *Air*, of the Weight of a Guiny, and then examining it by weight in the *water*, he will preſently diſcover whether it be Gold or not.

There comes into my thoughts another poſſible way of counterfeiting *Guinys*, but becauſe 'tis very likely that Coiners will not light upon it, and it cannot be practiſed on any of the *Guinys* already coined, the fear of teaching bad men a skill that probably they will not otherwiſe acquire, makes me forbear to mention it, though the fraud may be quickly diſcovered, ſometimes by the bare Eye, and always by our Inſtrument, and the Ballance ; whereof publick Advertiſement may be given, if there ſhall appear need of it.

And now I have this to add about the Conſtruction of this Inſtrument, that perhaps it would not be very difficult to propoſe a much more accurate and elaborate Contrivance, if 'twere thought fit to propound any that would require an extraordinary skill in the Artificer to make it, and ſome conſiderable skill or dexterity in the Perſon that is to uſe it; but the ſlight Conſtruction, hitherto deſcribed, ſeem'd to ſuit better with my Principal aim, which was, to propoſe at preſent an Inſtrument as ſimple, cheap, and eaſie to be employed and kept in order, as I could well examine *Guinys* with; little doubting but that the Principle, upon which this is framed, being well underſtood and conſidered, will, if it be found uſeful, be further improved by new Applications and more Artificial Contrivances.

Explication of the Figures.



In Fig. 1. AB, the Stem or Pipe.

C E, the two parts of the Ball ſoder'd together.

B C DE, the Ball it ſelf.

F, the Screw.

G, the Stirrup, ſomewhat repreſented out of its place.

H, the Mark to which a Copper-plate, of equal weight in the Air with the Guiny, depreſſes the Inſtrument.

I, the Mark to which a true Guiny ſinks it.

Fig. 2. is the Screw by it ſelf, to be put upon or taken from the (ſhort) undermoſt ſtem of the Inſtrument.

Fig. 3. the perforated plates of Lead or other metal, to be put on as ballaſt upon the undermoſt ſtem.

Fig. 4. the undermoſt Stem with a perforated Ballaſt-plate put upon it.

Fig. 5. the Stirrup, that may be employed inſtead of a Screw.

Fig. 6. A B C, the Glaſs-inſtrument.

D D D, the Coin hanging at the bottom of it, and ſupported by four horſe-hairs, or ſlender ſtrings of ſilk.

Fig. 7. The undermoſt Stem of the Glaſs-Inſtrument, to which, being ſtreight and ſolid, a Screw is faſtned on with horſe-hair, orotherwiſe.

Fig. 8. A B C D, the ſmall Glaſs-Inſtrument for eſtimating the ſpecifique gravity of Liquors. (of which an account may be expected in our next.)

E E, the Quickſilver and Water that is imployed as Ballaſt to ſink it in an erected poſture.

The

The Third Section.

Repreſenting the Uſes of this Inſtrument as relating to Metals.

THere is in the nature of the thing ſuch a Connection between the *Fabrick* and *Uſe* of our Inſtrument, that I could not well deſcribe it without plainly intimating the Principal uſes of it. Wherefore I ſhall here but ſummarily repeat thoſe that are delivered already, and make a more explicit mention of thoſe few, that have been either omitted, or but lightly touched.

The I. Uſe.

The firſt uſe, and that which was mainly intended, is, eaſily and cheaply to diſcriminate true Guinys from counterfeit, without defacing or any ways injuring the Coin. But of this uſe I have ſpoken largely enough already, and therefore ſhall advance to the next.

The II. Uſe.

Any other kind of Gold-Coin that is near about the weight of a *Guiny*, may be examined by our Inſtrument after the manner above delivered; but more eaſily, if it want of the weight of a Guiny than if it exceed it. For in caſe it be heavier, as is a Twenty ſhilling piece of broad Gold, the Ballaſt, whether internal or external, of the Inſtrument muſt be taken off, that ſo heavy a Coin may not quite ſink it; whereas, if the Coin propos'd be lighter than a Guiny, one may add as much Gold (of the ſame alloy) beaten into thin plates, as, with the Coin propos'd, will make up in the Air the weight of a Guiny. For then this aggregate, being examin'd as if it were a Guiny, will diſcover in the Water, whether the Coin be right or counterfeit. I ſhall add, that, if the piece, to be examined, be not much heavy-er than a Guiny, it may be convenient to paſs a very ſmall perforated plate of Copper or Lead over the upper ſtem (or pipe,) ſo as to make it reſt upon the ball before the Inſtrument is adjuſted. For, by this means nothing need be altered *beneath the Ball*; and ſuch pieces of metal (of which ſeveral differingly heavy may be eaſily provided) being thin and light, will not, (as trial has ſhewn) make the Inſtrument top-heavy, though one of them be plac'd above the Center of Gravity, and may be very readily taken off, and (if need be) ſcrap'd or fil'd to lighten the Inſtrument, when an extraordinarily heavy Guiny, or a Coin ſomewhat more weighty than a Guiny, is to be examin'd.

But to return to what I was ſaying about adding a weight of Gold to a piece of propos'd Coin; in order to this uſe it will be neceſſary, that the Slit or Aperture at the bottom of the Inſtrument, which is to be ſhut and open'd by the lateral Screw, be made (as it eaſily may without Inconvenience) wide enough to receive double the thickneſs of a Guiny, that ſo different Coins, as *Engliſh*, *French*, *Spaniſh*, &c. and the Grain-weights, neceſſary to bring them to the weight required (in the Air,) may be ſecurely faſten'd to the Inſtrument by the Screw.

If the Ball be large, and the Pipe well proportioned to it, Coins, that do not much exceed the weight of a Guiny, may be examin'd without much altering the weight of our Inſtrument, provided it be at firſt adjuſted ſo, as that a Guiny will not depreſs it ſo far as not to leave a conſiderable part of the pipe above water, that the Coin heavier than a Guiny may not be able to draw it quite under water.

According to the Method above deſcribed, may *half Guinys* be examin'd. For, if the Inſtrument be good, it will ſhew a manifeſt difference, if, inſtead of an intire Guiny, you faſten in the ſcrew a half Guiny that you know to be true, and that which is ſuſpected to be counterfeit; adding a grain-weight or two of Gold in caſe the propoſed Coin needs it; I ſay, a *grain-weight of Gold,* becauſe, if it be of *Braſs,* of which the grain weights, commonly uſed, are made, it will looſe in Water more than it ſhould of the weight it had in the Air; and therefore it will be uſeful to ſuch as intend to try ſeveral ſorts of *Engliſh* Coins, as *Angels, Two and twenty ſhilling pieces, double Guinys,*&c. to have by them a numerous ſet of grains, (about whoſe ſhape, by the way, one need not be curious, that not being material) made of a thin plate of ſterling Gold.

The III. Uſe.

If the Inſtrument be skilfully fitted for ſuch a purpoſe, it may be made to ſerve to examine ſome ſorts of *white money* leſs heavy than half Crowns. And becauſe it may be uſeful to know in general what Coins may, and what may not, be examin'd by this or that particular Inſtrument propos'd, I ſhall here add a general way that is not difficult for finding this out; namely *firſt*, by weighing the piece of Gold or Silver in the Air, and afterwards in the Water, and ſubſtracting the latter from the former, to obtain the difference of the two weights: And *next*, by weighing alſo in the Air and in the Water a piece of Copper, or Braſs, if *this* be the likelyeſt to be employed in counterfeiting the Coin, and obſerving likewiſe the difference between thoſe weights. For, the leſſer of theſe differences being ſubſtracted from the greater, the remains will ſhew, how much the true piece of Coin will outweigh the other in the water, and conſequently if ſo many grains, as this reſidue amounts to, being added to the weight of the lighter metal, do make a ſufficiently manifeſt depreſſion of it below the Mark it would ſtay at without that addition, one may probably conclude, that the difference between a true and counterfeit piece of Coin propos'd, will be diſcoverable by the Inſtrument.

The cheapneſs of theſe ſlight Inſtruments being conſidered, it may be expedient for Goldſmiths and others, that have frequent occaſions to examine various ſorts of Coin, to have a ſeveral Inſtrument adjuſted for each of them, to ſave themſelves ſome pain and trouble. But if the Ball be made large, and fitted with a ſtem ſlender and long enough, one may quickly by changing the balaſt-plates, as occaſion requires, fit the ſame Inſtrument to examine Coins of differing metals, and of very differing weights. For one of theſe, made of Copper, ſerves me to examine both Guinys and Crown-pieces of Silver, and half Crowns too; and it may be eaſily made to ſerve alſo for divers forreign Coins.

The IV. Uſe.

'Tis a great complaint of Pewterers, that the Tinn they buy of the Miners or Merchants is often adulterated with Lead, as they find to their prejudice when they have made Veſſels of it. And many others, that are Buyers, complain much more of divers Pewterers for putting too much Lead into their Pewter, becauſe Lead is by many times cheaper than Tinn. On theſe accounts I ſhall add, to the other uſe of our Inſtrument, ſomething that relates to Tinn and Pewter. Though I muſt take notice, that ſome Tinn may perhaps be found a little heavier *in ſpecie* than ordinary, although no fraud intervene; becauſe I have obſerv'd ſome Tinn (as I elſewhere relate) to contain ſome, though but a very little, proportion of Gold or Silver. But this being no uſual caſe, I ſhall proceed to ſay, that the Pewterer may judge, whether the Miner or Merchant have deceived him; if, taking a piece of Tinn that he knows to be pure, and is of a convenient weight, he obſerves how much it depreſſes the Pipe, and then makes the like obſervation with an equal piece of the Tinn ſuſpected to have Lead or ſome other Metal in it. For if this depreſſes the Inſtrument much lower than the other, 'twill juſtifie the ſuſpition: Since as Gold, being the heavieſt of Metals, cannot be allay'd by any other that will not depreſs our Inſtrument leſs than Gold can do; ſo Tinn, being the lighteſt of Metals, cannot be mixed with any other that will not ſink it lower than unmixt Tinn, (ſtill ſuppoſing the weights to be the ſame in the Air.)

And as for the Buyers of Pewter, 'twill be eaſie for them (if they think it worth while) to find by our Inſtrument, if there be too much or but enough of Lead mixt with the Tinn in an aſſign'd portion of Pewter of a convenient weight to be examin'd by it. For, having once obſerved, how much the Inſtrument is depreſt by a piece of two, three, or four Drams, or even an Ounce weight of Pewter, which is known to be good, and to contain ſuch a proportion of Lead in reference to the Tinn, if you load the Inſtrument with an equally heavy piece of any other maſs of Pewter propounded, if the Inſtrument ſink deeper, 'twill be a ſign, that the former proportion of Lead may be very *probably* argued to exceed in the mixture; I ſay, *probably*, becauſe perhaps 'tis poſſible to embaſe Pewter by mixing not only Lead but other Mineral Subſtances, whoſe ſpecific gravity is not well known: But yet I ſay *very* probably, becauſe the addition of too much Lead is the moſt gainful way of adulterating Pewter. And the other things that ſome imploy, as *Regulus of Antimony*, *Tinn-glaſs*, *Copper* and *Speltar*, are ſeldom uſed in great quantities; and if I thought it worth the while, I could facilitate the Diſcovery even of theſe by adding, what I have obſerved of their differing ſpecific Gravities, and ſome other things that I think fitter to be here omitted than to have time and words ſpent upon them.

The V. Uſe.

The laſt uſe, I ſhall now mention of our Inſtrument in reference to Metals, is, that it may aſſiſt us to eſtimate the quality of Metalline Mixtures, whether in Coins or other Maſſes, and to gueſs at the proportion of the Ingredients that compoſe them. For, ſince we have formerly ſeen, that the ſame Inſtrument, employed to examine Guinys, ſerved alſo for Crown-pieces of Silver that wanted of an Ounce leſs than a twentieth part of that weight, 'twill be eaſily granted, that the ſame Inſtrument, and more eaſily, that a larger one, may be ſo fitted, as to help Goldſmiths, Chymiſts and others, that are not acquainted with Hydroſtaticks, to make ſuch an eſtimate as will not much deceive them of the fineneſs of Gold and its differing Allays with Silver or ſome other determinate Metal.

In order to this, the Inſtrument may be fitted to ſink to the tip of the Pipe with ſome determinate weight of the fineſt Gold, as of 24 Carats, as they call that which is moſt pure and fine. But 'twill be convenient, that this Metal, in the Air, be juſt an Ounce, or half an Ounce, or ſome ſuch determinate weight, that is commodiouſly diviſible into many *aliquot* parts. Then you may make a mixture that contains a known proportion of the metal wherewith you allay the Gold; as if it hold 19 or 15 parts of Gold, and one of Silver; and, letting the Inſtrument ſettle in the Water, mark the place where the Surface of the Water cuts the ſtem or pipe. And then putting-in an other mixture, wherein the Silver has a new and greater proportion to the Gold; as if the former be an eighteenth or a fourteenth part of the later, you may obſerve, how much leſs than before this depreſſes the Inſtrument, and ſo you may proceed with as many mixtures or degrees of Allays as you think fit, or can be diſtinguiſhed conveniently on the ſtem; being alwayes careful, that, whatever be the proportion of the two Ingredients, the weight of the Maſs in the Air be juſt the ſame with that of the pure Gold, which we have lately ſuppoſed to be one Ounce, or half an Ounce.

By the ſame method may be examin'd the differing Alloys of pure Silver upon the admixture of ſuch and ſuch determinat proportions of Copper or any other Metal lighter *in ſpecie* than Silver; and by the ſame way, with a ſlight variation, 'twill not be difficult to eſtimate, how much divers Coins, whether of Silver or Gold, are more or leſs embas'd by the known ignobler Metal that is mixt in the piece propos'd.

And though this way of determining the Alloys of Metalls be not ſo exact as is poſſible to be propos'd by the help of Hydroſtaticks and Calculation; yet it may be very uſeful to Chymiſts, Goldſmiths, Refiners, and others, that are unacquainted with Hydroſtatical matters, to make without trouble or ſupputation eſtimates that will not *much* deceive them, and perhaps will come nearer the Truth, not only than the eſtimates wont to be made by the Touchſtone, but perhaps too, than ſome of thoſe that divers make with trouble, and inconvenience, and charge. And indeed I was chiefly invited to communicate this Trifle and ſpend ſo many words about it by the requeſt of ſome Ingenious Diſciples of *Vulcan*, who thought they perceived, that, by this way, they could oftentimes make better eſtimates of the ſucceſs of their graduating, and ſome other, operations upon Metals, than otherwiſe they ſhould be able; this way greatly accommodating them by this particular advantage, that they may from time to time try the degrees of purity, and ſome other conſiderable alterations of their mixtures, without at all deſtroying or injuring them, though they have not yet attain'd the pitch they aim at and expect; whereas, if they happen to be too forward, as often they are, in examining the Productions of their Labours by the cupel or ſevere Cementations, what they would try may be deſtroyed or ſpoilt in its way to a perfection, which otherwiſe, in their opinion, it might in due time be brought to.

Perhaps it may not be amiſs on this occaſion to add as an Improvement of this *fifth* Uſe of our Inſtrument, that it may be employ'd to examine other mixtures beſides allay'd Coins, and that, if the Inſtrument be adjuſted to an Ounce, for inſtance, of pure Copper, it may help men to make an eſtimat of the Alloy of Tinn, or the quantity of it that is oftentimes added to Copper, to make differing ſorts of Bell-metal, and of thoſe metalline *Specula*, whether plain or concave, that are call'd Steel-glaſſes, as alſo of Soders conſiſting of certain proportions of Silver and Braſs, or Copper; in all which, and divers others, the diſcovery of the proportion of the Ingredients may, on ſome occaſions, be uſeful to Tradeſmen, as well as deſirable by *Virtuoſi.* And though I have obſerved, that, by mixture, Tinn and Copper acquire a ſpecific gravity ſomwhat differing from what their Ingredients promiſe; yet, ſince the Inſtrument is to be fitted for ſuch eſtimates, not by calculation, but by tryals, the eſtimates may be made near enough to the Truth.

A Letter written to the Publiſher by the Learned Mr. Ray, *containing ſome Conſiderations on the Conjecture in* Numb. 114. *of theſe Tracts, about the ſwimming Bladders in Fiſhes.*

This Letter is not mentioned in the Contents, becauſe it was thought at the time when the firſt ſheet was a printing, the Diſcourſe about the precedent Inſtrument would have taken up all the room of this Tract.

SIR,

I was much pleaſed and ſatisfied with the ingenious conjecture I found in your *Tranſactions* of *May* laſt, *pag.* 310. concerning the ſwimming Bladders of Fiſhes; and perſwade my ſelf that the Author thereof hath hit upon their true uſe, *viz.* to ſuſtain or keep them up in any depth of water. For 1. it hath been obſerved by ſome, and I find it in Mr. *Willughbyes* general notes of Fiſhes, that if the ſwimming bladder of any Fiſh be pricked or broken, ſuch a Fiſh ſinks preſently to the bottom, and can neither ſupport nor raiſe up it ſelf in the water. 2. Flat Fiſhes, as *Soles*, *Plaiſe*, &c. which lie alwaies groveling at the bottom, have no ſwimming bladders that I could ever find. 3. In moſt Fiſhes there is a manifeſt channel leading from the gullet or upper orifice of the ſtomach to the ſaid bladder, which without doubt ſerves for conveying air thereinto, as may eaſily be tried by any one that pleaſes. But though air may be received into the bladder, yet is there a value or ſome other contrivance to hinder the egreſs of it; for you ſhall ſooner break the bladder than force any air out by this channel. Yet in *Sturgeons* Mr. *Willughby* hath obſerved, that preſſing the bladder, the ſtomach preſently ſwelled: So that it ſeems in that Fiſh the air paſſes freely both wayes. Poſſibly, the Fiſh while alive may have an ability to raiſe up this valve, and let out air upon occaſion, which yet I doubt of, becauſe other Animals have no ſuch faculty of opening any valves made to ſtop the reflux of fluids. But I verily think, there is in the coat of this bladder a muſculous power to contract it when the Fiſh liſts: For, in many Fiſhes it is very thick and opake, like the coat of an Artery (which hath, as Dr. *Willis* obſerves, ſuch a muſcular faculty) as for example in all the Cod-kind; in ſome, v. g. the *Hake*, called in Latin *Merlucius*, it is inwardly covered with a red carneous ſubſtance, which I take to be muſculous fleſh; in others, it is forked at the top, and to each horn hath a muſcle affixed. Now the muſculous force need not be great, being ſtill aſſiſted by the water as the Fiſh deſcends; the preſſure of the water being much greater at the bottom than at the top, as appears by the aſcending bubble. But whereas it is ſaid, Perhaps the Fiſh can by its ſides or ſome other defence keep off the preſſure of the water, and give the air leave to dilate it ſelf: It may be objected, if it can do ſo, what needs then any air-bladder? the cavity of the *abdomen* may ſerve the turn. To which I anſwer, that this power of dilating the *abdomen* by the muſcles may aſſiſt Fiſhes to riſe, whoſe natural place is toward the bottom; and the Air compreſſed in the bladder dilating it ſelf as the Fiſh aſcends, facilitates the action of the muſcles. But thoſe Fiſhes that deſcend by contracting the bladder, letting the contracting muſcle ceaſe to act, will riſe again of their own accord, the Air within dilating it ſelf, as we ſee in glaſs bubbles by compreſſion of the Air in them deſcending, which as ſoon as the force is removed aſcend without more ado. Beſides the flat Fiſhes I before mentioned, all the cartilagineous kind, as well flat as long, want ſwimming bladders: What courſe they uſe to aſcend and deſcend in the water, I know not. Many of the Eel-kind (not all) have ſwimming bladders; yet can they hardly raiſe themſelves in the water, by reaſon of the length and weight of their tails: I ſuppoſe, the Air-bladder being near their heads helps them to lift up their head and fore-part: Great diverſity there is of ſwimming bladders in reſpect of figure, ſubſtance, ſituation and connexion in ſeveral Fiſhes: But not being able to give you any reaſonable account of each, I ſhall forbear to add any thing further of them.

S I R,

Your very humble Servant

Middleton, June
22. 1675.

John Ray.

Errata left uncorrected in *Numb.* 112.

Pag. 258. l. 33. r. *firſt Emerſion.* p. 266. l. 14. for *IKL* r. *ILK.*

Errata in *Namb.* 114.

Pag. 312. l. 7. r. *your acceptance.* p. 321. l. 21. r. *many times over refuted.* ibid. l. 26. r. *thoſe days.* ibid. l. 35. enclose the words from that of *hoping* to that of *America* in a parentheſis, that the ſenſe may go on coherently for what follows: p. 322. l. 3 *J. B. Gent.* is put for *J. W. Gent.* who wrote a large and very obliging Volum of Husbandry, entituled *Syſtema Agriculturæ*, or *The Myſtery of Agriculture diſcover'd*, &c. in fol. publiſh't *A.* 1669. As for *J. B.* Gent; he wrote the Epitome there extracted. p. 324. l. 12. r. *and when beſt.*

Errata in this *Numb.* 115.

Pag. 330. l. 20. r. *lighter* for *higher.*

London, Printed by *T. R.* for *John Martyn*, Printer to the *Royal Society.* 1675.

PHILOSOPHICAL
TRANSACTIONS.

July 26. 1675.

The CONTENTS.

An extract of a Letter, relating to the Eſſay Inſtrument *deſcribed in the foregoing Tract. A way, of making all ſorts of Fruits, Kernels,&c. grow to an extraordinary bigneſs. Advertiſements,occaſioned by* Numb. 114, *upon Froſts in ſome parts of* Scotland; *of black Winds; of the warm and fertilizing Steams of the ſurface of the Earth, Stones, Rocks, Waters; of Petrifying and Metallizing waters, with ſome Notes for the Gardening of* Scotland: *by Dr.* J. Beal. *Mr.* Flamſtead's *Letter concerning Mr.* Horrox's *Lunar Syſteme. An account of Mr.* Flamſtead, *and Monſ.* Bulialdus, *touching the late Eclipſe of the Moon. An Account of a Book;* viz. *The Planters Manual, &c. by* Charles Cotton *Eſquire.*

An extract of a Letter, written by a Friend to the Publiſher out of the Country, July 24. 1675; *relating to the Contents of the* Tract *next foregoing.*

I Am very much obliged for the laſt pacquet which came ſafe, and I was not a little tranſported with Joy in the peruſal of Honourable Mr. *Boyles Eſſay Inſtrument*, as he hath expreſſed the five principal uſes of it, which obliges Mankind (that hath a regard for Honeſty or Juſtice; or hath any concernment for *Coins*, or Mettals) to return him grateful Acknowledgments. Few of us are not ſometimes cheated with counterfeit Mony, and I think there is ſcarce a Houſe-keeper which is not abuſed by falſe Mettals. We are all at the mercy of *Pewterers*, and, in the Country, we begin to be in no better caſe in our dealings with *Goldſmiths* and *Silverſmiths*. Long ſince I took notice, how light and Silver-like the Pewter was, which deſcended to us from our great Grandmothers; but as ſoon as (to follow the faſhion) we changed it, the *weight* and the very *colour* was altered. And, as as they have had the wit to lead us on to change the faſhion of our *Pewter*, as oft as we change the faſhion of our Hats, our Pewter is in every change more and more embaſed: And, if our Silverſmiths hold on their degrading mixtures, I ſhall queſtion, whether our *Silver-plate* may not ſhortly come down to approach our Fore-fathers *Pewter*: I mean in the Country, where 'tis never or ſeldom tried.

But, *Sir*, ſince our honourable Philoſopher hath diſcovered the pure Gold, and digged out the Oar; I hope, you and others of the *R. Society* will find out ſome ingenious and docible perſons, who, for reaſonable gain to themſelves, and for common good, will furniſh us with ſtore of theſe Inſtruments, fitted, and ready prepared for all the uſes.

I have marvelled, That the want of willing Perſons to execute, and to furniſh for Common practice the excellent diſcoveries and inſtructive Inſtruments, which ſome great Philoſophers have lately brought to light, have not diſcouraged the Inventors themſelves.

Let me offer to you two or three *Inſtances*. If the ſame Mr. *Boyles Statical Baroſcope*, deſcribed and publiſhed in your *Firſt Vol. N.* 14. *p.* 231; or perhaps, if the *Mercurial Baroſcope* had been more generally ſpread in the hands of many Sagicious Gentlemen, I conceive, we ſhould have heard leſs noiſe againſt the Gravity and Gravitation of the Air. I cannot ſee what place the *Statical Baroſcope* would give, either for the *Funicular* or for the *Hobbian* Objections, or yet for the *Difficiles Nugæ*. Both the ſaid ſorts of *Baroſcopes* do ſhew *to the eye* the Gravitation of Air from the heavieſt to the lighteſt, in *all changes*, to *every degree*, and mutually explain and confirm each other: And the ſmall *Hydroſtatical Inſtrument* may make ſome reſemblance of the ſame or like importance, in *Liquids*. I gueſs, that in a very long *clear Glaſs* one may ſee, whether the *Bladders* of *thoſe Fiſhes* which have the thinneſt and cleareſt film, do expand and contract, as they aſcend and deſcend with the *Hydroſtatic Inſtrument*.

My *next* Inſtance may be the *Celeſtial* and *Aerial Magnets*, as propoſed, and to ſome effects diſcovered by Mr. *Boyle*. But this will hardly be throughly inveſtigated by any other than the *Sons of Art*. We ſee, with what confidence ſome men pretend to *Aſtrology*, even in trifles; yet how lazy or unwilling the whole Tribe is to make proof, either of that force or kind of *Subterraneal Steams*, or of *Celeſtial* or *Ethereal Influences*; no, not of the Moon, or any Planet or Conſtellation, to any conſiderable accurateneſs. The *Sun* indeed will not permit all his Power to be concealed from the dulleſt of Mankind; but certainly, as the Temperate weather of the *Spring* differs, in efficacy, from the Temperate weather of the *Autumn*; the Sunſhine of the *Eaſt*, from the Sunſhine of the *Weſt*; *May dew*, from the *dew* of *Auguſt*; the keen *winds* of *March*, from *winds* of the ſame keeneſs in *January*, *&c.* ſo one would be apt to think, the Increaſe or Decreaſe of the *Moon*, the *Perigee* or the *Apogee*, and perhaps the *Libratures*, lately diſcovered, as the Aſpects of other *Planets*, and thoſe *Conſtellations* to which all the Old *Georgical* Writers do attribute ſo much, may have their peculiar effects, if duly and luckily examined. We can hardly imagine, that at *Farnham*, and other places, where many hundreds of Acres of ſtrong-ſented *Hopps* are fully ripe, be given no peculiar indication beſides odour in the Air; or when large fields of *Beans* and *Peaſe* are in full bloſſom, that they have no effect, beſides the *Odour*. And for *Mineral* and other Subterraneal Steams, the *Baroſcopes*, with comparing other circumſtances, may ſeem to indicate, when they aſcend with more than ordinary impetuoſity, and when rebated. In all my Obſervations, I alwaies found the Air *lighteſt* in the greateſt Storms, and a little before, and at the beginning of great falls and continued Rain.

Thirdly, I inſtance the *Statical Hygroſcope*, which is ſo fully expreſſed and directed by the ſame Mr. *Boyle*, that 'tis eaſie for an ordinary Capacity, with a little diligence, to make conſiderable Diſcoveries by it, for the near concernments of Mans-health.

Many other *Inſtances* I could name, which, if we had ſuch a Man as Mr. *Sellar*, who could employ Workmen to perfect the Inſtruments, and to ſell them off; it would (doubtleſs) procure us many Operatours, and many free Diſcoveries in ſome points of *Philoſophy*, of which we have yet heard but little Tydings.

A way of making all ſorts of Plants, Trees, Fruits, Flowers, and Legums, *grow to an extraordinary bigneſs, communicated in the* Journal des Scavans, *as it was taken out of the ſmall Tract, entituled,* Inſtruction facile pour connoitre toutes ſortes d'*Orangers* & *Citroniers: Here inſerted for Experiment.*

THe whole Secret conſiſts in ſowing all ſorts of Grains and planting Kernels, in Beds of Earth, at the very time when the Sun enters into the *Vernal Equinox*, and to take them up, when they are ſtrong enough to be tranſplanted, at the time of the *Full Moon*; which time is alwaies to be obſerved, if you will take them up and replant them again.

But now, to know the moment, or very near the moment of the ſaid Equinox, the Author of this Secret imparts alſo the way of finding that out with certainty. Take, *ſaith he*, ſome Aſhes of *Vine-wood*, put them in an Earthen-pot leaded, or in a pot of the White earth of *Fayence* very clean, pour upon it Common-water, or Fountain, or Rain-water that is very clear, from the $\frac{9}{19}$ of *March* to the $\frac{11}{21}$ of the ſame, and at the time when the Sun enters into the Equinoctial point, you will ſee the Aſhes make the Water turbid, and then is the time of ſowing your Grains and planting your Kernels.

So far this Author; which though it will ſeem very improbable to many, yet was thought fit to be here propoſed for Trial, upon the conſideration that there are ſome *improbable Truths.*

Advertiſements, occaſioned by the Remarks printed in Numb. 114, *upon Froſts in ſome parts of* Scotland, *differing in their Anniverſary Seaſons and Force from our ordinary Froſts in* England: *Of Black Winds and Tempeſts: Of the warm or fertilizing Temperature and Steams of the ſurface of the Earth, Stones, Rocks, Springs, Waters, (ſome in ſome places, more than other in other places;) Of Petrifying and Metallizing Waters: With ſome hints for the Horti-culture of* Scotland: *By the Reverend and Learned Dr.* J. Beal, *F.R.S.; who by way of Letter imparted them to the Publiſher.*

SIR,

IT may ſeem, by the curious Remarks ſent to you from *Scotland*, that we are yet to ſeek out the Cauſes and original Source, as well as the Principles and Nature, of *Froſts*. I wiſh, I were able to name all circumſtances that may be cauſative of Froſts, Heats, Winds, and Tempeſts. I know by experience, that the ſcituation of the place is conſiderable for ſome of theſe; but, after much diligence and troubleſome reſearches, I cannot define the proximity or diſtance, nor all the requiſites, that ought to be concurrent for all the ſtrange effects I have obſerv'd in them.

2. Honourable Mr. *Boyle*, according to his uſual accurateneſs, hath given us an account of the antecedent, concomitant, and following changes of Air, and Weather, and very black Winds, when the Earthquake was about *Oxford*, *Januar.* 19. 1665; recited in *Numb.* 11. *p.* 176. *of your Tracts.* And 'tis deſcribed by Dr. *Wallis*, *Numb.* 10. *p.* 168, with the *weight* of the Air about the time. I conceive, the Subterraneous ſteams might be the cauſe of ſuch a Midland Earthquake. And I know no ſurer or better way to find out the nature and properties of thoſe Steams, than by obſerving the Effects, and all the Alterations of the Air, as they did.

3. Of the ſtrange *Froſt*, which was here about *Chriſtmas* 1672, and the ſudden bloſſoming and budding Heats which followed, I ſent you the particulars, as they are in your *Numb.* 90, from *Somerſetſhire*, ſcribling *raptim*, and concealing my Name, becauſe I never heard of the like, (having often obſerv'd the Multitude, after their Nine daies wonder, and their own Fabulous exaggerations, to fall ſo far back as to deny the truth of what themſelves ſaw and felt;) yet, ſince it was in the main ſubſtance confirmed from

Oxford by Dr. *Wallis*, as it is recorded in your *Numb.* 92, and was alſo teſtified, in the body of it, by a Gentleman of the beſt credit and Judgment amongſt us, whoſe hands and eyes were good Witneſſes to what he wrote; I do now own it; and indeed with a deſire, that our friendly Correſpondents in *Scotland* may be pleaſed to compare it with ſome of the *phænomena* by them mentioned. For, though theirs be remarkable for frequency and anniverſary conſtancy, this for extraordinary; yet this ſhews, that a *Froſt* may be very fierce and dangerous in the Air, and on the tops of ſome Hills and Plains, whilſt in many other places it keeps at two, three or four foot diſtance above the ground, Rivers, and Lakes; and may wander, at ſome difference of time, in ſome places very furious; in other places, intermediate and not far aſunder, very remiſs and abated; where it was fierce, alwaies at the height of Trees at leaſt, never on the ground vehement, that I could hear of, but on *Saliſbury Plains*, which are very high grounds. And further, if I were worthy, I would ſollicit it, that ſome Almanack-makers may be perſwaded to record *changes* of Air, and *extraordinary* Winds and Weather, as is there directed: That we may have fewer falſe predictions, and more faithful Regiſters, both of the fore-running Signs, and of the following Events; which may be for ſound and deep Philoſophy, domeſtical and political uſes, and indeed for many more uſes, than I have there expreſſed. Doubtleſs, as Old Sea-men have their prognoſticks of Storms at Sea, ſo may the like be had on Land, to prepare us to ſecure our Houſes and Lives. By the obſervations, which I have often made of *coaſting Tempeſts*, Lightning, and fatal Thunder-bolts (as we call them) as ſoon as I heard of the late Hurrican at *Utrecht* and *Amſterdam*, I did fear more miſchief to follow in other places. So it hath fallen out often in my memory. I took ſpecial notice of thoſe *Wandring Tempeſts* in *England*, of which Dr. *Tho. Jackſon* gave a general account, publiſht *An.* 1637: I noted the particular damages then done, and ſome terrible executions before, and ſeveral times ſince Dr. *Jackſons* account.

4. I have heard, that Mr. *Joſhua Childray*, whoſe ingenious diſquiſitions you have publiſhed in ſeveral of your Volumes, made a Journal of the quantity of *Rain* that fell at any time where he abode, in *England*, theſe many years. And Mr. *Axe* lately told me, that he thinks, *his* Notes may be recovered, where he deceaſed.

We may ſee, what hath been ſolicited, *Hiſt.R.S. p.*173. If in ſome Almanacks in *England, Scotland, Ireland, New England*, and other remote parts of his Majeſties Dominions, Regiſters were well begun of the moſt remarkable Prognoſticks and Events, &c. this would put a juſt value upon ſuch Almanacks, and much advance our knowledge in this Philoſophical Age, in matters of great concernment, perhaps to fore-ſee *Dearths, Mortalities, &c.*

5. Alſo, to promote the Inquiries above, I muſt acknowledge my ſelf the Scribler of the ſhort Note beginning your Tract of *May* laſt, *N.*114; and ſhall now proceed to enlarge a little upon the Inſtances there briefly toucht.

6. Firſt, 'tis vulgarly known, that the ſurface of ſome ground is ſo hollow, light, and ſwoln by a hot and working ferment, that it muſt needs ſend up a warming ſteam; as appears by the quick riddance of all the Snow that falls on it, and (in many places within my knowledge) diſſolving the Snow before it falls on the ground: *that* ſome Stones by an innate warmth, and ſome Waters do impregnate the Earth; and *that* other Stones by their contrary qualities, or by their poſitions, have a quite contrary operation; *that* ſtreams of Water running over Lime-ſtones, or through veins of Marle, or of that ſort of Chalk which is kind for manure (for there is a ſort of Chalk which is barren) doth fertilize; *that* ſome other Waters are hungry, *uliginous* and *corroſive*; and *that* thoſe Rivers which are filled with a Black water, by Rain running over Heaths, do much miſchief where they over-flow, begetting Heath all over the Paſtures. Theſe are vulgarities; but I think them very pertinent, and worthy to be conſidered for our purpoſes. And there are many Petrifying waters, and Metallizing waters; as alſo Petrifying and Metallizing-Steams. For the former, we cannot diſbelieve the Ancients, ſince our Moderns have lately had a ſad example of diſpatching Petrefaction. And for Metallizing-Steams, I refer to your *Numb.*27.*p.*194. where we are inform'd, that in *Italy* Quickſilver is found at the roots and in the juyce of a Plant; and that in *Moravia, Hungary, Peru*, and other parts, Mineral-juyces are found in Vegetables. Neither can I with confidence contradict the numerous Inſtances offered in *Miſcell. curioſ. Lipſiæ Annus primus* 1670, *Obſerv.*131.*p.*290, under the Title, *Aurum Vegetabile*; ſince I have heard good proofs, that all Mettals, and Gold it ſelf, is continually generated, and we know nothing diſenabled to emit its

proper Atmoſphere; and ſince our Honourable Philoſopher, Mr. *Boyle*, hath ſhewed us, that *Fire* and *Flame* (as perhaps the Solar beams) may be incorporated to increaſe the weight, and (as I take it) the bulk alſo of *Lead*, and other Mettals and Minerals, &c. See Mr. *Boyles* Experiments at the end of his *Effluviums*, and *Hiſt. R.S. p.*228; and ſince Gold it ſelf is by mixture volatilized in your *N.*87; and ſince our Old Philoſophers do allow the Sun to give a potent aſſiſtance in the generation of all things that are generated. But may not Mines be diſcovered by examining the juyces of Vegetables growing on the place, and by the Waters which iſſue thence, as elſewhere I have propoſed?

7. But to return to our *Vulgarities*, which may chance to have the richeſt uſefulneſs or pertinence to our Inquiries. In the ſharpeſt *Froſt*, that I have known theſe many years, the ground having been alſo ſome daies cover'd with Snow, I ſaw a ſmall ſtream (no bigger than might run from the mouth of an ordinary quart Bottle, as now we have them of green Glaſs,) ſliding merrily, and ſmoaking all the way over the *lawns:* I could not diſcern, that any Snow had fallen within five or ſix foot on each ſide; if it did, none remained there, and ſo far the Graſs at that time, about *Chriſtmas*, was as green as any Leek, and the Froſt (ſo far) apparently diſſolved: *Of this I then wrote to our Worthy friend Mr.* Evelyn, *not for any wonder, (for perhaps there are or may be thouſands of ſuch ſmoaking Streams in* England,) *but only repreſenting, How ſuch a Stream may warm a manſion, and cheriſh tender evergreens well ſheltered from winds, and flowry Gardens, all the hard Winter, and do us better ſervice in an extream hot Summer.* I have been perplext in obſerving my ſelf, an hundred times, the difference of Heat and Cold between two Villages, within a mile of each other, where we could diſcern no diſparity of Hills or Rivers; only the Springs in the one were all ſhallower, in the other ſome were deeper. In a large Tract of Land the ſurface was of ſo hot a ferment, that at every ſtep I trod up to the ankles. I cauſed it to be examined by the Spade, and found it, as far as I tried here and there, at a foot depth, as thick ſet with Pibble-ſtones as if a Cauſey had been pitcht there; yet was it a quick and pregnant Land, for Flowers, Fruit-trees, and Vines, theſe Pibbles being diſlodged, and ſome of them carried away. I have ſeen Fields where the ſurface did ſeem cover'd with Pibbles, not Flinty, nor Lime-ſtone, yet they bore full burthens of

the beſt and cleaneſt rye and oats: The husbandmen took away the pebbles from off the ſurface; and then the land bore as ſtrong wheat, peaſe and barley, as before it bore oats and rye. In other parts where I have been, the husbandmen took away the ſtones which ſeemed to cover the fields, and ſuſtein'd great loſs for their coſtly labour; their corn was much weaker for ſome years after. I can attribute theſe differing events to nothing, but the difference of ſtones, ſome intrinſically warm, and impregnating above ground; ſome cold and not impregnating, whileſt in that poſition, or ſituation. Yet ſome experience forbids me to deny, that even ſuch ſtones, when covered with earth, at a certain depth, may increaſe the fertility of the land. And the hot and bibulous land, which drinks up the rain and ſnow as ſoon as it falls, ſeems to have ſome cooling refreſhment from under-ground pebbles, which are of a cold, ſtiff, and ſullen nature.

8. Sir, ſome years ago, I wrote to you from Sir *W. St.* mouth, that he could ſhew you, where water paſſeth very ſlowly over ſtone, and thence, drop by drop, falls down white, like curdled milk, and is afterwards there petrified. This doth ſeem to ſhew the manner of petrification. And this I take to be the ſlow and cooling operation of ſome kind of ſtones, more than of other.

9. What I have to ſay of warming and fertilizing *Rocks*, I ſhall deliver with an aſpect towards *Scotland*, for Horticulture. I had ſeveral times conference with Sir *Robert Morray* B.M. (who was an honour to his Countrey, and a bleſſing to the place where he abode) concerning eſculent and olitary gardens, and (under one) Nurſeries of Fruit-trees, and other uſeful Vegetables in *Scotland*. I repreſented, *that*, almoſt within my memory, they are become the chief relief of *England*; *that* 'tis lately found, that auſtere fruit yield the ſtrong and ſprightful liquor, which reſembles the Wine of the grape; *that* the return of gain from Gardens is great and ſpeedy; Nurſeries neither a chargeable nor a burthenſome addition, but a congruous engagement of the Multitudes to perſevere in the nobleſt kind of Agriculture. Sir *R.M.* granted all that I ſaid; and I am ſure, he acted and executed all that he could for the good of his own Countrey, and for *England*, &c. But, *ſaith he*, there are ſo many Rocks, and ſuch bleak winds in *Scotland*, that they

can hardly draw in the ſame yoke with *England* for Gardens and Orchards. I replied, that in *Devon* and *Cornwall*, they fenced their Gardens and Orchards with *Flanders* furrs and tall holly from the ſea-winds, and they have lofty firrs, and goodly Pines in *Scotland*; and *New England*, (where the winds are as keen, and the ſnow and froſts as deep, and as long laſting, as in many parts of *Scotland*,) is yet full of fruitful Orchards. And if *Scotland* be farther in the North, yet *Norway* is rich in Boſcage; and the ſeeds of the Hemlock-tree, Spruce, and Cedars from *New England*, *New-found land*, and *Virginia*, may perhaps rejoice in the exchange of *Northern America*, for the North of this Iſland. And *Scotland* may ſay, *Non tam averſus equos noſtro Sol vertit ab Orbe.* The Sun affords them a longer Summers day in the remoteſt North, than at *Rome*. And 'tis a point of good Philoſophy and good husbandry to find out, what vegetables are apteſt to bake the better by that advantage. And *Scotland* hath no need to borrow Wit and Induſtry from their neighbours: Witneſs their Linnen trade, their Fiſhery, their Mines, their Arts, Artifices, and Manufactures; ſome of theſe as beneficial to them, or ſoon may be ſo, as our famous and great Staple trade is, at this day, to *England*, *comparatis comparandis*. Briefly, the Summer Sun ariſeth more early, and ſhines as bright on St. *Andrews*, as on the *Roman Capitol*; and the *Vatican* is not ſo near to *Uranoburg*, as is *Edinburg*. And their flowry Philologers and Learned *Boetii* *, *Buchanans*, *Barcleys*, and hundreds more, never reſigned their verdant laurels to *Politians*, *Bembo*'s, or other Ciſ-Alpines. Nor do they ſhrink from aſſiſting the Modern Reſtauration of ſolid, real and operative Philoſophy. To come cloſe to our Buſenis, this I told Sir *R. M.* I durſt undertake, that when *Edinburg* and their chief Towns and Univerſities ſhall plant Kitchin-gardens, as we do now in *England*, they ſhall receive their grateful reward the firſt year, and bear the charges of their Nurſeries abundantly; and ſo hold on; and, within ſeven years, ſecure their poſterity of the benefit, and delight themſelves with the fruit of their pleaſing labour. *And thus one man may drive on the wheel, which a thouſand hands cannot ſtop, when it is running on, and imploy thouſands of poor, at good worth.*

* Hector Boëtius *highly valued by* Eraſmus.

10. Now for fertilizing Rocks, I made bold to repeat it often, That within a days journey of the heart of *England*, I could ſhew three Gardens, the beſt that I have ſeen for flowry beauties, *Engliſh* evergreens, and ſallads, all the Winter long; all theſe on a hard rock, in moſt places but one foot deep under earth; in ſome two, in few places three foot deep; very lofty hills cloſe on the South-ſide, the declivity of the Gardens due North; and the rock perfectly bare next to the Walls on the North-ſide. And I ſaw rich Hoppyards in the ſame caſe, but in deeper ground, next to the garden, on the ſouth-ſide of the garden: And theſe Northern Hopyards eſcaped many blaſts, which ſeized on the Hopyards on the South-ſide of the Hill. On the ſteep aſcent, on the North-ſide of one of theſe rocky hills, where no plough could come, I ſaw a Gentleman ploughing up the ſhallow turf with a hand-plough for Flaxe; and I ſaw good flaxe grow there, to the largeneſs of a village-field. His hand-plough had a ſtem of Aſh or Sally about ſeven foot long, and a plate on one ſide neer the end, to turn the turf; a coulter to be let out ſhorter or longer, to cut the turfe 4, 5, or more inches deep, as the land affords it; and a ſmall iron-wheel: This hand-plouh, the Maſter and his man, by turns, drove before them with a walking ſpade; leathern aprons before them, to ſave their cloaths. For the cauſes of this hardy fertility, *viderint Philoſophi.* I am ſure of the truth of what I write: And I am willing to apprehend, that, if in *Scotland* they did, in fit places, ſow the beſt Flax ſeed of *Flanders*, as many here do, they would make good Holland-linnen, Laune and Cambrick, as now they do Scotch-cloth.

11. It is no hard task to ſhovel down the ſhallow and moſſy turf, from the deepeſt declivities of rocks, into places where it may have ſome receptacle or ſtay; and there to impregnate it with the ſpade and compoſt, for Gardens, or Vineyards. And there the *Tenth part of an acre in Gardening may yield more profit, than ten acres of ordinary tillage in a Corn field.* Of this computation I can make large proofs, both in Countrey-villages, and at great diſtance from any market-Town. I am ſo much a ſtranger to *Scotland*, that I cannot ſay, whether Saffron, Licorice, Hops, Madder, Oade, or what other rich commodities, do proſper there; but this I know, that our *Engliſh Saffron and Licorice* do far ex-

cell

cell all the forreign, which our Druggiſts do ſell us from the South: And ſince Vines and Mulberries have travailed from the remoteſt Eaſt, through all the hotteſt Countreys, and have abundantly enriched our next borderers, and have received acceptable hoſpitality, as far as they have been tried in this our Iſland: We have encouragement enough to adventure the cheap and eaſie Trial. Some of my correſpondents tried the Mulberry and Silkworm as far in the North as *Huntingtonſhire* and *Cheſhire*; and Sir *James Craig* tried them in the moiſteſt place of *Ireland*, in the County of *Caran* in *Ulſter*; and all boaſted their ſucceſs, *An.* 1651, 1652, 53, 54, 55. Wherever Mulberries grow, I am apt to expect, that the worms will live, and ſpin, and furniſh the *Silken Trade.*

12. Laſtly, to obtain favour, or pardon, and ſome credit for what hath been hitherto alledged, and withall to encourage bold adventures in Horticulture and Agriculture, and to ſuggeſt noble arguments for ſublimer, deeper, and more Philoſophical Diſquiſitions, to thoſe Excellent Perſons, whoſe buſineſs, glory, and happineſs it is, *Rerum cognoſcere cauſus*; I ſhall only tranſcribe the Learned *Laurembergs* Collections, *Horticulturæ* l. 1. c. 13. Sect. 5. *Memoratu dignum eſt, quod de* Novâ Zembla *&* Gronlandiâ *narrant ij, qui viderunt.* Nova Zembla *ſub lat.* 76. *Sept. ſterilis undiquaque eſt, nec gramini, aut frondibus, nec animalibus benignis hoſpitium præbens:* Gronlandia *verò multo quàm iſta borealior, pabuli graminiſque proventum alit uberrimum. In hâc pecorum & lactariorum tanta ubertas, ut etiam ingentes acervos butyri & caſeorum componant incolæ, eoſque vænum exponant eò navigantibus. Tam benignus & felix eſt hujus regionis genius, ut ne quidem ab Hybernis nivium & frigorum injuriis graminis vigorem & virorem patiatur extingui, (unde primum Inſulæ nomen:) ubi è contra, in* Novâ Zemblâ *mortua ſunt omnia.*

13. *Non eſt quod obtendat quiſquam, ab arido, pumicoſo, & ſaxoſo ſolo* Novæ Zemblæ, *nihilo plus frugum aut graminis expectandum, quàm à cautibus Suecicis.* Groenlandiæ *autem ſolum pingue, & fæcundum, nihil mirum ſi fæliciter quæque producat. At ſciat ille, ne in fertiliſſima quidem Germania prata ac paſcua, ſub hyberno gelu nivibuſque virorem ſuum illæſum ſervare, pecorique ſufficiens præbere pabulum; quod tamen non denegatum* Groenlandiæ, *in extremo mundi cardine deliteſcenti.*

14. *Deinde, ſi ineptam, & infelicem* Novæ Zemblæ *terram ſpectes, & hanc tantopere ungeas, ei tam ſimilis eſt* Terzera *inſula, una ex ſeptem* Azoribus, *quàm ovum ovo, aut lac lacti. Totius hujus Inſulæ* Terzeræ *regio montoſa eſt, cautibus præruptis deformata, dura, nec ulli vel ferro vel chalybi cedens; vera congeries ac compages cautium, petrarum, ſaxorum. Jurares, te videre innumeros adamantes, ſpectata loci duritie, acumine, & inæqualitate, ut etiam ne calceatis quidem pedibus ſine periculo humus calcari poſſit. Et tamen totus hic monſtroſus tractus (teſtis eſt* Hugo Linſcot. *in Itiner.) tam ferax eſt vini, tam densè conſitus vineis, ut æſtate ne latus quidem digitus de ſolo ipſo oculis notari poſſit. Ipſæ vitium radices intimè infixæ ſunt mediis cautibus, ut miraculi ſimile videatur, vel uvam iſtic locorum naſci. Quin, quod magis mirêre, loca glebis pinguiſſimis inſtructa, nullâ induſtriâ aut labore induci poſſunt, ut vel racemum unum ferre, vitibuſque plantandis ſe ſubmittere velint. Nihil huc ad fertilitatem impedimenti confert adamantina telluris durities, nihil commodi pinguis ejuſdem conſtitutio :* Quippe ſolo natura ſubeſt, *Virg. Georg.2. v.49.*

15. *Poterit & aliud documentum dari ex* Joſ. à Coſta, *Hiſt. Ind. Occid. qui refert, in* Yea & Villacuri, T̃hs Peru *Provinciis, vineas feliciſſimè creſcere, quæ tamen nec pluviis ullis humectantur, (eas enim iſti loco cælum denegat,) neque hominum operâ unquam irrigantur, poſitæ interim ſpongioſis, arenoſis, & ſiccis locis; nihilominus incredibilem vinorum vim ſuppeditantes quotannis, quale beneficium à locis multò amænioribus, in eadem cœli inclinatione, fruſtra expectatur.*

16. *Itaque, quod demonſtrandum propoſueram,* (ſaith he,) *prædita eſt quæque Telluris portio peculiari virtute, & ſucceſſu producendi ſata, qualis aliis locis, felicius fortè poſitis, à Deo & Natura neutiquam fuit indulta.*

17. This was the information, which the inquiſitive Dr. *Lauremberg* publiſhed *Roſtochi, Anno* 1631. Perhaps the large expreſſions concerning *Greenland* and *Nova Zembla* muſt be limited to ſome known parts of both. But 'tis ſo certain, that ſome rocks are barren, and ſome pregnant, that we have good proof of ſome Rocks almoſt bare, which bear trees, and ſtony Vegetables trimly adorn'd with cryſtalline or gliſtering beauties, beyond the imitation of Art. And I have drawn a paper, in which I can

ſhew you, from the remoter antiquities, as far as the learnedeſt *Greeks* and *Romans* could reach; that the hills and mountains, and ſuch flinty precipices, and ſuch light land, as was worſt for tillage, and paſture, was beſt for Vineyards, the ſteep ſides eaſily pared into the Trenches, for a conſtant ſupply; and that the Wine from the Hills, and from the Mountains, was ever eſteemed the richeſt. And *Milford haven* was once famous for plenty of rich Wine from the Mountains of *Wales*, and may be ſo again hereafter, if we go on, as we begin to do; and 'tis as cheap to try the Vines of *Smyrna,* and *Greece*, of the *Canaries*, of *Monteſiaſco*, the *Falernian* and *Chian*, as any vulgar Vine; *but for Vines in our Northern climates we ſhould chooſe the Southern declivity, and make a trench to carry off the rain above, before the ſtream falls into the Trenches of Vines.* 'Tis as well the Honour as the Wealth of a people to plant and till their land with the richeſt and moſt uſeful commodities it will bear; and where nature is difficult, there to ſurmount it with Art, and Induſtry. And 'tis better to improve our own Countrey, than to conquer another. And a little Farm well tilled is better than a Mannor of large waſte: *Laudato ingentia rura*, *Exiguum colito,* ſaid *Columella* after *Virgil.* 'Tis not eaſie to number, how many wide Tracts of waſte land in *England* and *Wales* have been reduced by artificial culture to be the richeſt land, ſince the reign of Queen *Elizabeth.*

18. Sir, You will excuſe this prolixity, ſince we are more neerly concerned to ſearch out the cauſes of Fertility, and to find the beſt remedies againſt Sterility, than to detect many minute and curious rarities, and ſome of thoſe, which we call *Occult Qualities.* But I doubt, I have taken too much pains, and have given you too much trouble in proving, that warming ſteams do perpetually aſcend from ſome quick Springs, and from ſome Tracts of land, ſince 'tis ſo *vulgarly* obſerved, that when the ſnow falls, and lies long on the brows of ſmall hills, not worthy the name of hills, within a mile round about us, it very ſeldome ſnowes in our Villages but melts in the falling, or falls in a few large flakes, which are alſo diſſolved as ſoon as they touch the Earth, or make no long ſtay there.

19. And yet I would gladly beſtow more pains to find out all the Arts requiſite to determine the nature of all ſubterraneous ſteams: This is like to be all the means we have, to ſearch out the nature and variety of all thoſe materials, which ſtuff up this Terraqueous Globe, 7000 miles in Diameter. For, by our deepeſt mines on land, and by all the gulfs and whirl-pools in the Seas, we have not *ab origine* to this day, entred deeper through the Mineral and Rocky hoopes, ribbs, and cruſts of the earth, as I think, than two or three miles from the plane; which in compariſon of 7000 miles is leſs than the ſhell and *cutis* of an Egg compared with the liquors and ſubſtance therein contained.

Sir, At next ſitting down to ſcribble, God willing, I intend to give you ſome Experimental Demonſtrations of the frequent and almoſt perpetual changes of the Surface of the whole Globe, or Maſs of Earth, to a greater depth, than many are willing to imagine; as appendant to this loos draught, and of importance in Agriculture, and affording freſh enquiries, and a conſiderable task for future Geographers. But you muſt expect no other language, or compoſure, than what comes firſt to a running pen, and agrees with ruſticities; for which I have more affections, than ſpare minutes to offer to you.

Your humble ſervant

J. Beale.

Mr. Flamſteads *Letter of* July 24. 1675. *to the Publiſher, relating to another, printed in Num.* 110. *of theſe Tracts, concerning M.* Horroxes *Lunar Syſteme.*

I Have never before troubled you on the like occaſion, which makes me hope, you will pardon this, which I write with no ſmall reluctancy: Nor had I now adventured to concern you with it, if I had not found it frequently the ſubject of the *Tranſactions*, to vindicate good Inventions to their proper Authors.

The vulgarly received *Lunar Syſtemes*, though as little agreeable to Nature, as the Heavens, were entertained from one Aſtronomer to another with little alterations, from the Noble *Tycho* to the Author of the *Caroline Tables*: But when I had found by many curious and careful meaſures of the *Moons diameters*, that the Heavens would never admit thoſe Hypotheſes, which made the diameter of the Perigeon-Moon in the Quadratures larger than the Full Moon on the Perigee; and *that* only the *Syſteme* of Mr. *Horrox*, which I had found in Mr. *Crabtrees* letters, would repreſent it as obſerved broadeſt at Full; and afterwards *that* it would accord well with ſome Obſervations to which the Vulgar Tables agreed not within $\frac{1}{5}$ of a degree: I thought, it might be worth my labour to adorn it with *Numbers*, that it might be fit for trial, as ſoon as it appeared in publick; to which I added an explication to be found in the Edition of his poſthumous works. This Syſteme has been well approved of by ſeveral good Aſtronomers, and Mr. *Street* has eſteemed it ſo good, that he has printed a figure of it with the deſcription of his Planetary inſtrument; but without acknowledging the proper Author, or ſo much as naming him more then once, and then in ſuch terms, as may perſuade any perſon not well acquainted with Mr. *Horrox* his works, that he was but ſome inconſiderable Aſtronomer, and Mr. *Streets* print a clear different Syſteme. *All*, ſaith he, *being ſomewhat different from the limitations of the Theory of* Horrox *and Tables therewith publiſht.* This obliged me when I found it only different in the poſition of the Libratory circle, to take notice of it in a letter to Mr. *Collins*, from whom you received the information, and with my conſent printed the extract of it: In which I deſigned nothing but to aſſert to the dead an Invention, which he eſteemed the beſt he ever lighted upon, and which, queſtionleſs, is the chief of his Monuments: This had I neglected, I had been unjuſt to the dead, whoſe papers paſſed through my hands to the Publick; nor have, I hope, been at all injurious to Mr. *Street* in it, as may appear by my Letter, if conſidered by any unintereſſed perſon.

For, my aſſertion concerning his figure of the Lunar Syſteme was, that the contrivance of it, for the Motion of Longitude, was no other then what was taken from Mr. *Horrox*'s Theory and my Explication; whereby I conceive no man would underſtand me of his *Numbers*, ſince I never mentioned them, and he has publiſhed none, but courſe Mean motions, with a little Table or two for finding the Latitude; but I took notice, *that the form was the ſame*, and *the Excentricity varied, the Reflection or Variation altered in the ſame proportion as in the Horroxian Theory*; which that they are, I ſuppoſe he will not be ſo diſingenious to deny, ſince it will be manifeſtly evident to any that will be at the pains to compare his print with the 116 and 117 *Schemes*, belonging to my Explication: After which I know not what he has, that he may call his own, or that can entitle him to this Syſteme.

Perhaps he will ſay, he has transfer'd the *Libratory Circle* from the *Orbis magnus* to the tranſverſe diameter of the Ellipſis. But this is not material, ſince the effect is ſtill the ſame; and ſuppoſing the ſame diameter of the Libratory circle, the ſame Æquations will be found to a ſecond: So that hereby he only has gain'd a pretext to call the Syſteme his own, but he has rendred the Caſe of the Libration leſs intelligible.

He adds, that *he has encreas'd the quantity of the greateſt Libration* 22' *min.* ſo that the ſemidiameter of the little circle, that ſhews the variation, may ſubtend the greater Æquation of the Apogee, the mean excentricity being *Radius*. This indeed is an ingenious conceit; yet amounts it to no more, than an alteration; which whether the Heavens will admit of, we may juſtly queſtion. I find by Mr. *Horroxes* papers, that he uſed at firſt 12° precise, but upon farther experience diminiſhed it to 11°. 48′. This is all the real difference betwixt Mr. *Streets* print and the *Horroxian* Syſtem; for which whether he may juſtly call it his own, and charge me with untruths for denying it, I leave to ſuch perſons as are skilled in the Lunar Theory to judge. But, for my own part, I think, he has no more title to it, than Monſieur *Duret* had to the invention of the *Elliptical Hypotheſis*, becauſe he publiſhed it and the *Rudolphine Tables* in a better form, reduced to the Meridian of *Paris*; which he confeſſes in the title page of his *Richeleian* Tables; whoſe Ingenuity had Mr. *Street* imitated, he had done but juſtice to the memory of the dead, and ſaved me the trouble of this letter.

But the main part of his defence is, that his *Numbers* are not the ſame with thoſe publiſhed with the *Horroxian* Theory, and therefore the Syſteme not the ſame. I argue not how illogical the inference is; but how little ingenious, you may judge, in that he has publiſhed none but the aforementioned courſe ones, ſo that for the Excentricity and Variation we muſt believe him *gratis*: Beſides, 'tis not at all material; for I affirmed nothing concerning his *Numbers* at all, but the form or Contrivance of the Lunar plate, which he has not nor can make appear to be any other than the *Horroxian* Syſteme a little altered; but we may juſtly doubt, whether or no amended.

Nor is it pertinent what he ſays concerning the working of proportions in Triangles Mechanically. If he knew, how to do it, before me, no leſs did others much longer before him; nor am I at all beholding to him for this skill: But if he prefers calculations before it, to what purpoſe is this print of the Lunar plate or his contention about it? I might add, what beſides he is beholding to Mr. *Horrox* for, which he has ſcarce acknowledged; but I will forbear, not only to give him no cauſe of further controverſie, but alſo that I may no further trouble you, till I have a better and more grateful occaſion,

Sir,

I am your Servant

John Flamſtead.

Lunæ totaliter deficientis obſervationes, *Londini* in Arce Londinenſi habitæ, idque in ædibus & cum inſtrumentis *Jonæ More* Equ. Aurati, à *Johanne Flamſteadio*, Aſtr. Regio, Nocte ſequente d. Junii 26. 1675. ſt. vet.

COElum *à meridie præcedente nubibus denſiſſimis coopertum, exiguam nobis ſpem reliquerat defectum hunc obſervandi; hiſce tamen ſub occaſum Solis attenuatis, diſperſis deinde, & circa horizontem ſubſidentibus,* Jovem *primùm paulò ante mediam noctem, ſatellitibus ſuis quatuor ſtipatum, deinde* Lunam, *ſudo ſub Cœlo, vidimus. Intererat hiſce obſervationibus, multumque eas ſuâ adjuvabat diligentiâ Juvenis ingenioſus* Edmundus Hally, *Oxonienſis. Tubos adhibuimus præſtantes duos,* altero *ſeptem tantùm pedes longo, quo Lunæ captæ fuerunt diametri, & deficientis Lunæ partes reſiduæ illuſtratæ dimenſæ;* altero *pedum amplius quàm 23, quo notatæ à me phaſes, & umbræ veræ ad maculas appulſus. Binis etiam uſi fuimus horologiis, quæ bis ad ſolem ſeptimanâ præcedenti examinatæ, tempora cæleſtia accuratè exhibuiſſe inveniebantur: Quibus phaſium ſequentium tempora notavimus.*

	Hora horologii oſcillatorii.				
	h.	′	″		
1	13	01	00	*Lunæ diameter* 3190=31′.40″	*multoties repetitæ menſuræ tum à me tum ab adjutore* Edm. Hally.
2	13	08	30	*Penumbra nulla*	
3	13	11	00	*Rurſus Lunæ di.* 3191=31.46	
4	13	18	00	*Nulla penumbra.*	
5	13	37	50	*Nec etiamnum penumbræ veſtigium : jamque Luna nubes ſubtervolantes ſubiit, ſub quibus latuit uſq;*	
6	13	46	40	*Dum per earum hiatus penumbra denſa, vel forſan ipſum* initium *apparuit; ſed certus eſſe non poteram, quippe ab iis rurſus excepta dilituit, donec*	
7	13	51	40	E *nubibus elevatæ limbus notabili ſatis defectu laborare viſus eſt, obſcurato ſextante vel minimùm octante peripheriæ.*	
8	13	55	15	*Pentadactilus tectus.*	
9	14	02	20	*Porphyrites tectus.*	
10	14	05	30	*Sinæ limbus primus.*	
11	14	06	00	*Ætnæ limbus proximus.*	
12	14	08	40	*Partes reſiduæ illuminatæ* 2071=20′.38″.	
13	14	12	00	*Fixa exigua teleſcopica, minori tubo non viſibilis, in majori apparuit dimidium ferè capacitatis ejuſdem, vel* 15′. *à limbo apparenter inferiori diſtans.*	

	Hora horologii oſcillatorii.			
	h.	'	"	
14	14	17	45	*Partes illuminatæ reſiduæ*, 1655=16'. 27".
15	14	23	05	*Besbici limbus prior.*
16	14	26	03	*Horminius tectus.*
17	14	29	00	*Æmus tectus.*
18	14	30	45	*Partes illuſtratæ reſiduæ* --1047=10'. 24".
19	14	35	00	*Partes lucidæ reſiduæ* — 865=8. 38; *jamq; tubo longiori Fixa alia exigua apparuit, Maculæ Caſpiæ longitudinem à limbo Lunæ, latitudinem ejus, à linea per cuſpides ductâ dextram verſùs diſtans.*
20	14	37	15	*Umbra legebat occidentale littus Ponti.*
21	14	39	30	*Ipſa tetigit limbum primum Corocondometis.*
22	14	45	00	*Paludem Mæotiden tetigit.*
23	14	50	45	*Mæotis tota tecta.*
24	14	56	10	*Dubium an aliquid veri luminis ſupererat.*
25	14	56	55	Immerſio:

Certè enim lux primaria Lunam penitus deſerveat, ſcilicet è regione paulò ſupra montes Ripheos *& circa gradum limbi* Heveliani 330. *Hor.*14. 57'. 30", *limbus coloris cineritii per tubum apparuit. Aer à ſeptima obſervatione ad* Immerſionem *ſereniſſimus extitit; & lucula quædam albicans per totum defectûs tempus cuſpides obſcuratæ Lunæ viſa eſt inſidere, quæ eam etiam* poſt *immerſionem à parte, quæ ultimùm in umbram inciderat, reddebat conſpicuam.* Venerem *deinde tubo majori gibbam;* Saturnum *patulis auctum anſis vidimus, cujus tamen Satellites ob lucem adultam conſpicere non potuimus. Poſtero manè rurſus Horologia ad Solem examinata, horas præciſè ad altitudines erutas oſtendere comperimus.*

Tenuis admodùm erat Eclipſis hujus Penumbra, nec major quàm Sinæ *aut* Ætnæ *latitudo.* Palus Mæotis *lata apparuit admodùm, &, quàm maximè ferè potuit, à limbo Lunæ remota.* Mareotis *è contra compreſſa admodum, nec plus quàm dimidium longitudinis ipſius à limbo Lunæ diſtans.*

Iſaaci Bullialdi Obſervationes ejuſdem Eclipſis, ab ipſomet communicatæ in literis 17 *Julii* 1675. ſcriptis.

Initium veræ umbræ altâ Capellâ ad ortum	g. 18. 45'.	H. 13. 55'.
Umbra attigit Paludem Mæot. altâ Lyrâ ad occ.	g. 50. 51.	H. 14. 55.
Immerſio totalis altâ Lyrâ ad occ.	g. 48. 50.	H. 15. 6.
Tabulæ meæ Philolaicæ oſtendunt Initium Pariſiis		H. 13. 50. 44".
Immerſionem totalem		H. 15. 0. 58.
Heckerus *in Ephemerid. Initium Pariſis*		H. 13. 49. 26.
Immerſionem totam		H. 14. 56. 12.

An Accompt of a Book.

The Planters Manual: *Being* Inſtructions *for the* Raiſing, Planting *and* Cultivating *all ſorts of* Fruit-Trees; *whether* Stone-fruits, *or* Pepin-fruits, *with* their Natures *and* Seaſons; *very* uſeful *for ſuch as are* curious *in* Planting *and* Grafting. *By* Charles Cotton *Eſquire*, *in* 8°, *London*. 1675.

WE are *concerned* to take *ſpecial notice* of this Curious Treatiſe; it being publiſhed expreſly for the *publick* uſefulneſs, to advance the noble Work of raiſing the moſt delicious Orchard-fruit and Garden-fruit, which goes on ſo proſperouſly in *England*; ſo much for the honour of this Nation: The moſt lovely and moſt pleaſant part of Agriculture becoming the Inſpection of Gentlemen, and the moſt innocent Recreation of Princes and Nobles. We have, indeed, two excellent Tranſlations out of *French*, the *French Gardiner*, which hath much for Olitory Plants, and the Sieur *Le Gendre*, which is proper for Wall-fruit, both which I have formerly mentioned. Theſe two were the firſt and beſt experienced Maſters of noble Orchards and Gardens in *France*, and their elegant and accurate Tranſlations have done much good in *England*. And this our Judicious Author is, I think, the firſt that may juſtly be called an Engliſh Author of fruitful Gardens. For he accommodates all his *Inſtructions* to this *Climate* for the *faireſt Orchards of delicate fruit* (which is his proper Argument:) and *for the beſt ordering of ſuch tender fruit as require Walling*; and for the *choice and right ordering* of ſuch fruit, as *agrees beſt for Contreſpalliers*, or *Hedge-rows* over againſt the walled fruit, *That there may be pleaſant Walks or Alleys betwixt both thoſe rows*: And for *Dwarf trees* and *Shrubs*; of which he accounts for the *chief kinds*, giving us *very brief Catalogues* of the *very beſt ſorts* of *Cherries*, *Apricocks*, *Plums*, *Peaches*, *Pavyes*, *Apples*, and *Pears*: For which laſt he is largeſt in adviſing the choice for every Moneth, which to be eaten raw, and which to be baked.

He directs the choice of ſoyl for Orchards of delicate fruit, the preparation of ſoyl, and Compoſt for all kinds: What ſorts are fitteſt to be mixed; what ſorts to be continued in rows, or in Orchards, of one only kind; at what diſtance each kind to be planted; what aſpect beſt; what winds moſt to be avoided; excellent curioſities for the moſt advantagious Tranſplantations; for Nurſeries; when and how to be graffed; and how all theſe to be cultivated at all ſeaſons: Remedies or Preventions againſt Inſects, and other hurtful Creatures, and ſundry accidents incident to theſe Plantations, and their fruit.

And it ſeems (as our Author notes to the Reader) his Inſtructions are confirmed by Experience in our Engliſh ſoyl. We had many noble and royal Gardens of the moſt delicat fruit before; but here, the Gardiners reſerved and beſt approv'd Arts are publiſh't for the more general ſatisfaction of thoſe generous Engliſh who are willing to beſtow the beſt Ornaments upon their native Countrey, And certainly if we were as induſtriouſly addicted to ſeek abroad for curious Gardiners, and skilful Vinedreſſers, where the beſt may be had, as we are for leſs profitable and commendable offices; we might hope, in a ſhort time, to be as famous for fair Gardens and rich Encloſures, as we are at this time for well-ſtored Parks, fair Manſions, and numbers of beautifull *Villa*'s, all over England. To this purpoſe our Author encourages us to take care and pains to raiſe for our ſelves, and on our own ground, the beſt Commodities, which our Neighbours can ſhew, as far as our Climate by Art and Induſtry may be enforced to bear them; and our ſelves decline thoſe effeminacies, and other vices, which we are apt enough to cenſure in others; and which in the opinion of the wiſer ſort of men (ſaith he) are not conſiſtent either with the conſtitution, or indeed with the honour of this Nation.

A Liſt of ſome Philoſophical and other Curious Books, deſired by the Printer of theſe Tracts, (by whom they are to be had,) to be mentioned here.

THomæ Bartholini *Acta Medica & Philoſophica Haffnienſia An.* 1673. *figuris æneis ornata, volumen ſecundum. Hafniæ in* 4°.

Guerneri Rolfineii *Epitome Methodi Cognoſcendi & Curandi Particulares Corporis Affectus. edit. ſecunda Erffurt in* 4°.

Riolani *Enchiridium Anatomicum cum Var. Opuſc. auctum, in* 8°.

Chriſtiani Adolphi Balduini *Aurum Auræ Hermeticum, in* 12°.

Hermanni Grube *de Tranſplantatione Morborum Analyſis nova, in* 8°.

Jacobi Barneri *Prodromus Sennerti novi, ſeu Delineatio novi Medicinæ Syſtematis, Auguſtæ Vindelicor. in* 4°.

Hieronymi Mercurialis *de Arte Gymnaſtica Libri Sex, in quibus* Exer*citationum omnium vetuſtarum genera, loca, modi, facultates, & quidquid denique ad Corporis Humani* Exercitationes *pertinet, diligenter* Explicatur, *in* 4°.

Franciſci Redi *Experimenta circa res naturales, præſertim eas quæ huc ex Indiis adferuntur, cum figuris æneis, in* 12°.

Ejuſdem *Obſervationes de Viperis, in* 12°.

Laurentii Pignorii *de ſervis & eorum apud veteres Miniſteriis Commentarius cum fig. æneis in* 12.

Mappi *Diſſertationes Medicæ de potu calido, in* 4°.

Athanaſii Kircheri *Arca Noe in tres Libros Digeſta, in* Fol.

Martini Forbiſſeri *Hiſtoria Navigationis ex Anglia in Septentrionis & Occidentis tractum ſuſceptæ, in Latinum tranſlata, in* 4°.

Ægidii Strauchii *Aphoriſmi Aſtrologici, Methodicè Collecti, cum Methodica Doctrina Cypriani Leovitii de Judiciis Nativitatum, in* 12°.

Ejuſdem *de Numerorum Doctrina Aphoriſmi, in* 12°.

Wolfgangi Wedelii *Opiologia ad mentem Academiæ Naturæ Curioſorum, in* 4°.

Frider. Hoffmanni *M. D. Animadverſiones cum Annotationibus in Pharmacopoeiam Schroderianam, in* 4°.

Georg. Wolfg. Wedelii *Exercitationes pathologicæ, in* 4°.

Tumba Semiramidis Hermeticè ſigillata, in 12°.

Georg. Wolfg. Wedelii *Experimentum Chymicum novum de ſale Volatili Plantarum, in* 12°.

Joh. Chriſtiani Frommians *Tractatus de Faſcinatione novus & ſingularis, in quo faſcinatio Vulgaris profligatur, Naturalis confirmatur, & Magica examinatur; Theologis Juriſperitis, & Medicis lectu utilis, in* 4°.

Reſpirationis Swammerdamianæ Expiratio, unà cum Anatomia Neologic. Joannis de Radi &c. Auctore Joh. Baptiſta à Lamzwoorde, *in* 8°.

Johan. Jacobi Wepferi *Obſervationes Anatomicæ ex Cadaveribus eorum quos ſuſtulit Apoplexia, cum* Exer*citatione de ejus loco affecto, novis Obſervationibus auctæ: Scaffhuſii, in* 8o.

Hercules Medicus ſive Locorum Communium, Authore Wolfgang. Hofero, 2 *Voll.* 4°.

Marggravii *Materia Medica contracta, exhibens Simplicia & Compoſita Medicamenta, in* 4°.

Hermetis Ægyptiorum & Chemicorum ſapientia ab Herm. Conringii Animadverſionibus vindicata per Olaum Borrirhium, *in* 4o.

Phil. Hoechſtetteri *Obſervationum Medicinalium decades* 10, *in* 8°.

Franc. de le Boe Sylvii *Praxeos Medicæ liber quartus, in* 12o.

Theod. Turqueti D. *de Mayerne tractatus de Artbritide, in* 12°.

Andr. Moellenbroccii *Cochlearia Curioſa, in* 8°.

Honorati Fabri *Epiſtolæ tres de ſua Hypotheſi Philoſophica.*

Rohaulti *tractatus Phyſicus, in* 12°.

Jo. Elſholtii *Deſtillatoria Curioſa, in* 8°.

Rationale Vulnerum Lethalium Judicium, Auth. Cott. Welſch. *in* 8°.

Math. Tillingii *prodromus Praxeos Chimiatricæ, in* 8°.

H. Vogleri *de Valetudine Hominis cognoſcenda, in* 4°.

Dan. Lodovicus *de Volatilitate Salis Tartari diſſertatio, in* 12°.

LONDON,

Printed for *John Martyn*, Printer to the *Royal Society*, 1675.

Tran: No 117:

Fig.1.

Fig.2.